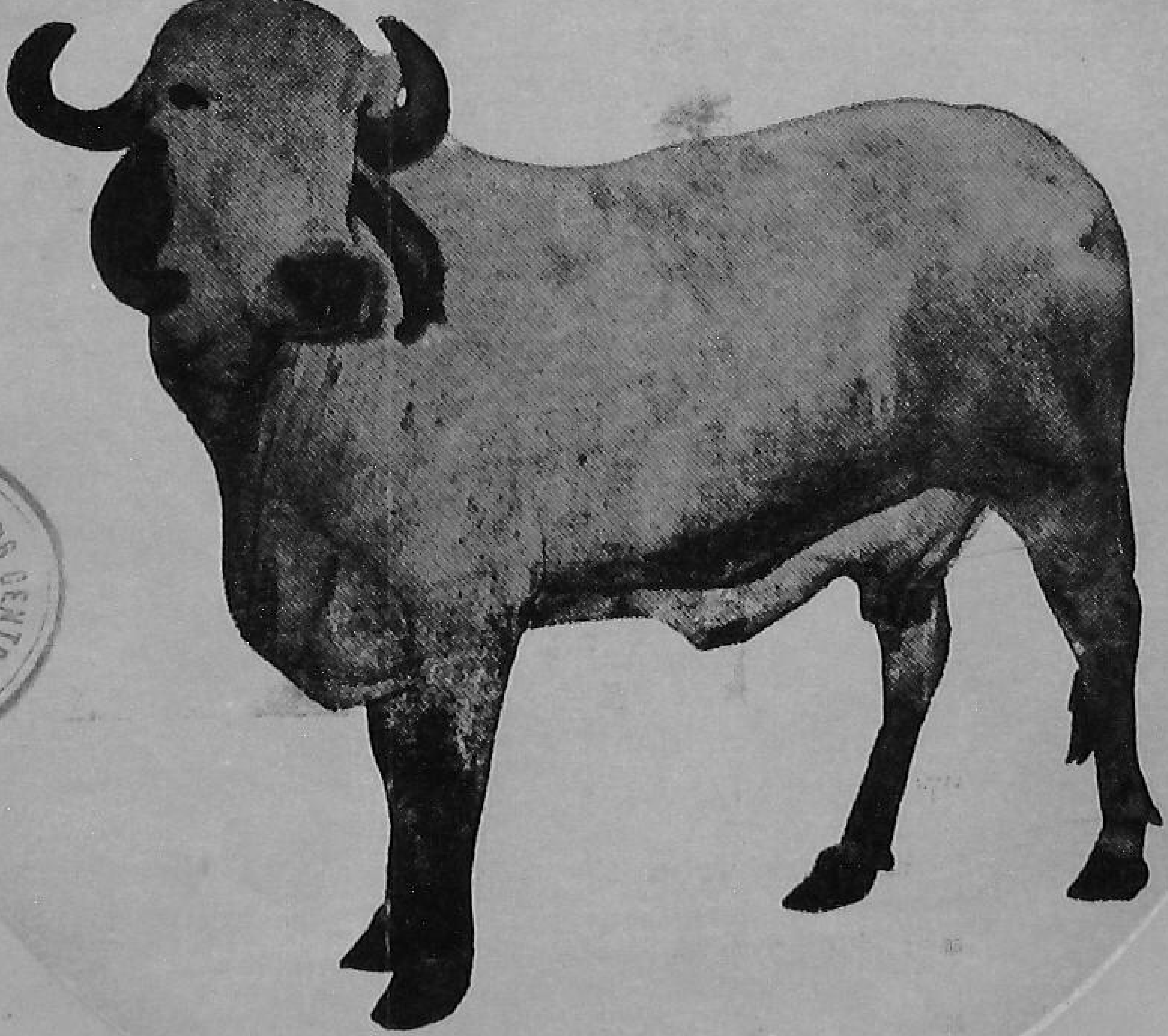
QUALITY—THE BASE OF PROSPERITY



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"If the quality of our diet is to be raised, we must produce more food and vegetables, more milk....this means that we should improve the quality of our cattle and increase the production of fodder crops. Again, even industry cannot flourish without prosperous agriculture...."

—Dr. S. Radhakrishnan

President of India

Said Lord ***Krishna*** **to** ***Arjuna*** :

गावः श्रेष्ठा पवित्राश्च पावना जगदुत्तमाः ।
ऋते दधिघृताभ्यां च नेह यज्ञः प्रवर्तते ॥
पयसा हविषा दध्ना शकृता मूत्रचर्मणा ।
अस्थिभिश्चोप कुर्वन्ति बालैः शृंगेश्च भारत ॥
गोभिस्तुल्यं न पश्यामि धनं किंचिदिहाच्युत ।
गावो लक्ष्म्याः सदा मूलम् गौषु पाप्मा न विध्यते ॥

"O Arjuna ! the cows are the most sacred and the highest, are the best in the world, for without curd and *ghee*, no *yajna* can be performed in the world. O Arjuna ! the cows help us through their milk, *ghee*, curd,......their hide, skin and their bones, hair and horns. O Partha ! I see no other wealth to be superior to the wealth of the cow. Cows in fact are the root of the wealth.........."

OUR

SLOGAN

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IS

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THE BASE

OF

PROSPERITY"

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CONTENTS

On quality the base of prosperity
Editorial .. 4

CCG : A Co-ordinated effort in cattle development
—Shri U.N. Dhebar .. 5

To save the cow, let us put more milk into her
—Dr. D. Sundresan, and Dr. K.K. Iya .. 9

For quality—control infectious diseases of cattle
—Shri J.M. Lall .. 14

Feed well for optimum production
—Dr. S.N. Ray .. 21

Animal climatology as an aid to the development of high quality cattle
—Shri James E. Johnston .. 26

Some facts about animal performance in relation to management
—Dr. A. Roy .. 29

Standardization and quality control in the marketing of livestock and livestock products
—Shri S. Jayaraman .. 37

Evolving quality animals through better Breeding
—Shri K.K. Shukla .. 42

Quality animals through better breeding
—Dr. K.S. Shetty .. 45

For ensuring quality, keep Animals free from disease
—Shri G.L. Sharma .. 53

Quality of the animals depends upon the quality of the personnel also!
—Shri Y.M. Parnerkar .. 61

OUR COVER : **Cow the nucleus of prosperity : (Art work by C.P. Tandan)**

Asstt. Editor : **P.C. ARYA** • *Sub-Editor* : **Greesh B. Mathur**

Editorial

ON QUALITY : THE BASE OF PROSPERITY

IT has been widely accepted and is being increasingly realised that the agriculture has to be the base of country's economy. It is inseperably tied up with animal husbandry and specifically the cow, in the context of very small holdings, shortage of capital resources for large-scale mechanisation of farming and with the problem of a vast and rapidly increasing population to be provided with regular work.

The latest census figures have further confirmed that India possesses the highest number of cattle in the world and still the average milk-yield of our cows and the performance of our bullocks is relatively very low.

The differential in between the quantity and the present condition of our cattle is a challenge.

To make-up this gap, the imperative need is of effecting an all-round improvement of our cattle with regard to the increased milk-yield of cows and better bullocks for traction purposes required for various agricultural operations. The slogan, therefore, given by the Council to to this year's Gosamvardhana Week celebration from the 29th October to 5th November' 62 is : "QUALITY—THE BASE OF PROSPERITY."

And the following pages present the different facets of this vital aspect. Efforts for increase in the milk-yield, better housing facilities, improved breeding and keeping the animals free from diseases are some of the issues on which the learned authors have contributed their valuable ideas in this Special issue. Equally important are the aspects of better management and the personnel responsible for executing the schemes and projects for cattle development. The quality of the workers from the lowest level of the *Gwala*— the cattle attendant at the village level—to the expert in the field has a deciding role in the proper implementation of our programmes for achieving the quality.

The publication of this Number would serve any purpose to the extent it inspires initiation of practical work and constructive thought in the direction of bringing the element of quality at every stage and phase of our cattle development work.

A co-ordinated effort in cattle development

By : **Shri U.N. Dhebar**

IT is nearly two years that the Central Council of Gosamvardhana has been reconstituted. It would not be unfair if the people expect the reconstituted Council to submit an account of its contribution. It is difficult for a functionary for himself to be the judge of his own work. The account given hereunder does suffer from that deficiency.

The Central Council of Gosamvardhana has been founded for four main reasons. As the late Rafi Saheb Kidwai put it, it was the vehicle to give satisfaction to the majority community by conceding to its sentiment. But by far the more important reason was to establish that cow was an economic animal; to remove the load of un-economic cattle so that useful cattle may be properly looked after and to enlighten the public about the correct and scientific advances in relation to the development of the cow. The first object led to the establishment of the Council; the second objective led to the concentration on the development of the cow from the point of view of her capacity to give work, milk, power and manure ; the third objective led to the introduction of the scheme of Gosadans and the last objective led to the establishment of Gosamvardhana Day that we are celebrating today.

The medium for achievement of all these objectives are ultimately the human beings that function in relation to animal husbandry problems in the field of administration, in research institutes, Pinjrapoles and Goshalas and the cattle breeders. The first concern of the re-constituted Council was to bring them all together. It was necessary for this purpose to establish a correct understanding of the problem ; to understand the limitations of each other and to function together with full knowledge of such limitations. I think a steady realisation is growing in the country but more especially at the Centre that the first condition of success in tackling the problem of the cow is the combined effort on the part of the administrator, the expert, the public

worker and the cattle breeder. I do not want to lay a claim that this consciousness has permeated in the States. But there is receptivity. So far as the Centre is concerned, I can, however, say with confidence that a bond of unity is growing among the expert, the officer and the public worker. The work is proceeding with reasonable satisfaction and they have begun to look towards one another as a team.

The first object as I have narrated above was to give satisfaction to the majority community. If the Government had intended to give superfluous satisfaction, it could have rest content by passing a legislation for prohibiting the cow slaughter and not appointing this Council. But the purpose of the Government and the public is not to prevent slaughter only. What is intended is to create conditions whereby the cow could serve the purposes for which she is intended and because of her usefulness it would be costlier to kill a cow than to maintain it. But nevertheless there were problems for the protection of even useful cattle. One of the most formidable problems which had defied solution so far was the problem of protection of high milk yielding animal in the northern tracts. A Committee was oppointed by the Government of India a few years back, but its report remained un-executed. The Council therefore appointed another Committee under the Chairmanship of Shri Shriman Narayan of the Planning Commission and I am happy to say that it has given a very useful and practical report. I am also glad that there has been a good response to the recommendations of that Committee and the West Bengal Government has already agreed to issue a blanket ban on the slaughter of Haryana cow within the territory of West Bengal. This will guarantee that the dry Haryana cattle taken to Bengal for the express purpose of supplying milk needs of that area will cease to be slaughtered as at present and will be saved. This is the first major step for the preservation of the quality breed. Similar discussions will be undertaken with the Maharashtra Government which area is another large scale purchaser of high quality animals. It must be realised that the annual depletion in the last so many decades has left the rich Haryana tract with only 25000 high milk yielding animals. The tragic story of annual export to Bombay and Calcutta and the annual slaughter of this quality animal is a sad chapter in the history of cattle development in India. Had we continued as at present, the stock would have literally been exhausted in a couple of decades. The second major step proposed in the direction of protection of the high milk yielding cattle is a Central legislation to regulate the inter-State movement of such cattle. This is being followed up.

It was never the intention of the Central Council of Gosamvardhana to neglect the lesser breeds. The Council has evolved a policy and efforts are being made to communicate the advantages of this policy to the state Governments. We have begun with areas where cow is still an economic animal.

On a careful study of the problem, it has been found that the work of feeding, weeding and breeding has got to be integrated with marketing if it has to show the results and take up the speed intended. The first intensive experiment was undertaken as a part of this policy in Bikaner district of Rajasthan. Eight villages were chosen and the collection of cow milk was commenced in the month of March this year with eight maunds. I am happy that within six months the figure has reached 150 maunds. It is our intention to extend this

experiment to a few other villages and reach up to 300 maunds by the end of December. Milk is frozen in a local ice factory and brought to Delhi in the common brake vans. The scheme has resulted in putting daily Rs. 1500 in the pockets of the breeders who also luckily happen to be farmers. There is a pressing demand from other villages for opening the collection centres. The possibilities of collection of milk are tremendous and we are studying the entire problem.

The Council, as a part of the same policy, is proceeding with another experiment in the very area. This is of starting portable creameries. The policy of the Council remains to be to supply cows milk in the liquid form. But in areas where the communications have not been developed and there is good amount of milk there is no reason why the breeder should not be brought under the scheme of marketing with the object of pushing forward the programme of weeding, feeding and breeding.

Gujarat the home of Gir and Kankrej is next on the list of the Council to be followed up by Andhra the home of Ongole. All these experiments are to be commenced as soon as the present surveys are over and preparations are made. The idea is to establish nucleus in the areas where good cows still exist and then to go on extending them so as to cover as time passes the entire area and show how the cow is still an economic animal.

With a view to provide an incentive to the breeders to keep cows it has been decided to get out as soon as possible from the present basis of milk pricing, namely the fat percentage which sets a premium on the buffalo and operates as a disincentive to the maintenance of cows. The Delhi Milk Supply Scheme has already made a beginning by starting to take cow milk at the same price as buffalo milk. It is opening new colonies roundabout Delhi on the Bikaner model. The cow milk will be collected from these rural areas to be followed up by the work of weeding, feeding and breeding by the Animal Husbandry Section of the Government of India. The attraction of equal prices for cow-milk will provide on the one hand incentive to the breeders to keep the cows enhance their production and on the other the availability of technical assistance will result in developing the cow.

In the exclusive buffalo area of Bombay Aarey Colony, the Bombay Milk Scheme has accepted to keep 500 cows. The results anticipated augur well for the experiment. The beginning will be made from the next month. This will serve as a good nucleus of further extension work. The Aarey Colony will simultanously take up the work of improvement of the breed maintained by it.

As a matter of fact this will serve as a future pattern of our milk schemes. They will slowly go over to cows milk and technical services will be simultaneously attended to by them or the Government.

There are about 3,000 Goshalas in India. The Council has taken up the work of collecting information about their working and when the study is complete it will be found that a large number of Goshalas have already taken up the work of scientific breeding and development.

The useless cattle was our major headache. An experiment has been undertaken in all its seriousness in U.P. under the direct management of the Council. Some data is already

available. It can be said that based on this data a Gosadan can be made self-sufficient.

The Council is also attending to other problems of a basic character. One of most important problems is the settlement of the breeding policy for each state and if possible for each region. This is very necessary if we want to fight the menace of non-descript animals. The characteristics of breed in every region require to be defined if there is not to be the promiscuous growth that is taking place at the present moment. It is only then that it will be possible to suggest a proper dual purpose male animal to upgrade the breed in the area, on scientific lines. The second most important enquiry undertaken by the Council is in the direction of the feeds and fodder availabilities in India including the alternate feeds to the present known feeds. These two enquires are on way and it is possible that we shall be able in the next year to start on something which is more definite than at present.

I must accept that this is merely a notional beginning. We are moving still slowly. But for a work of this character which is full of complications and involve so much of sentiment and prejudice, any move that we make must have the good-will and support of every section interested in this matter. I have no doubt that the cow with its potential to give work, milk, power, manure and even after she is dead, its hide, hooves and horns can never be an uneconomic animal. ●

WAIT FOR THE NEXT ISSUE

of

GOSAMVARDHANA

for

COVERAGE OF GOSAMVARDHANA WEEK CELEBRATIONS 1962

IN SOME OF THE STATES

To Save The Cow LET US PUT MORE MILK INTO HER

THE poor milk production per cow in India is well known. In a recent booklet—The Dying Cow— the Lt. Governor of Himachal Pradesh, Rajasaheb of Bhadri makes a case for saving the cow from extinction. The national average production per cow, per year, is estimated around 300 kg. of milk, which is not much more than what the wild cow produced just for her calf. India is said to have about 200 million heads of cattle, 40 million of which are zebu females over the age of 3 years. The United States of America, with about half this number of cows produces about four to five times the total production of our zebu cows. Thus an average American cow is about 8 times as productive as the Indian zebu cow. In a highly populated country like ours, it is clear that we will have to reduce the number of cattle and increase their productivity.

Before taking steps to improve the productivity of our animal, one has to appreciate the reasons for this low production, so that corrective steps could be taken. Often, we hear that once upon a time our cattle were more productive and that deterioration has set in. One should ascertain whether the deterioration has been due to genetic or environmental factors. Probably cattle breeding has been a very ill-organised, random affair. One of the accepted concepts of genetics is that, if mating is at random and if no selection is practised, a genetic equilibrium is maintained from generation to generation. For instance, in human life, marriage is a socialogical and individual matter not controlled to any appreciable extent by physical characteristics like weight, height etc. with the result that there is very little change in these characteristics in human beings from generation to generation. Similarly, it is very unlikely that there is any sizable deterioration in milk production due to genetic causes,

By Dr. D. Sundresan
Dr. K.K. IYA

except to the extent that natural selection favoured an unproductive animal which could stand the rigours of the environment than the more productive cow. So also, there is probably very little genetic improvement in the population during the last few decades, which is not the case with Western dairying where cattle improvement on an organized, scientific basis has been practised for several decades. The major part of the deterioration of Indian cattle productivity could be pinned down to inadequate feeding, housing and disease protection, resultant mostly because of uncontrolled increase in the cattle population.

Improvement of the Environment

There is near unanimity of agreement on the feeling that we have a much higher cattle population than is necessary and can be supported by our land resources. Our resources of feed are being shared by the useless unproductive cattle, which feed, if released, could be more effectively used. Thus the immediate need is to take steps for a drastic reduction in cattle numbers. In the Punjab, according to the 1961 census, there are 1,035,000 females over 3 years of age in milk and 650,000 females over 3 years not in milk. The proportion of milk to dry works out approximately 5:3. Under good feeding conditions, this could be improved to 7:3. Actually in many states of the country, the proportion is close to 1:1, which is highly uneconomical. The reduction of useless cattle will not only affect the breeding performance of the population but also give opportunity to feed better, the smaller number of better milking cows to get more milk per cow.

Better Feeding Practices :—Cultivated fodders, particularly of the leguminous kind provide a succulent, palatable feed of high nutritive value. This enables the productive cows to produce close to their maximum production possible with their particular genetic make-up. With highly nutritive fodders, often, very little grain feeds will be needed to provide the required nutrients for the maximum producing capacity. A good sized dairy cow can consume as much as 35-40 kg. of good fodder with sufficient legumes in it, which will provide all the nutrients needed for maintenance and 3-4 kg. of milk produced, per day. For milk production over this, an allowance of 1 kg. of concentrate (grain) mixture for every 2 kg. of milk will be adequate. It has been estimated that milk production could be doubled by adequate feeding. While this will remain an estimate unless established by investigations, it is quite clear that a sizable increase in milk production can be obtained by adequate and better feeding. Most of the improvement in milk production obtained in organized dairy farms can be attributed to better feeding and management practices.

Better Housing ; Under Indian conditions, except for few areas in the hills, cattle seldom need protection against cold. Adequately fed cattle are most comfortable at temperatures of 50-80°F. Our cattle need protection against sun and need adequate air circulation to remove heat dissipated from the body. Probably the most effective protection is provided by a large leafy tree. Structurally, a shed with open sides and thatched roof would be the best.

Improvement of Genetic Structures of Cattle

While very little genetic deterioration has taken place in our cattle, we have undoubtedly suffered from lack of genetic improvement. In a population, genetic improvement is brought about by the combined processes of

Selection and Mating Systems. Selection is vital in increasing the frequency of the desirable genes for milk production in the population. This is effected by culling the poor producers from the herd, thereby giving greater opportunity for a fewer cattle to spread their genes in the population. This necessarily means that the culled cattle should be removed from the breeding population. In the West, culled cattle are slaughtered which ensures that their poor genetic constitution does not influence the genotype of the future population. Some such effective measures like sterilisation needed, which will also automatically reduce cattle numbers. This in itself is highly desirable from the feeding and management point of view.

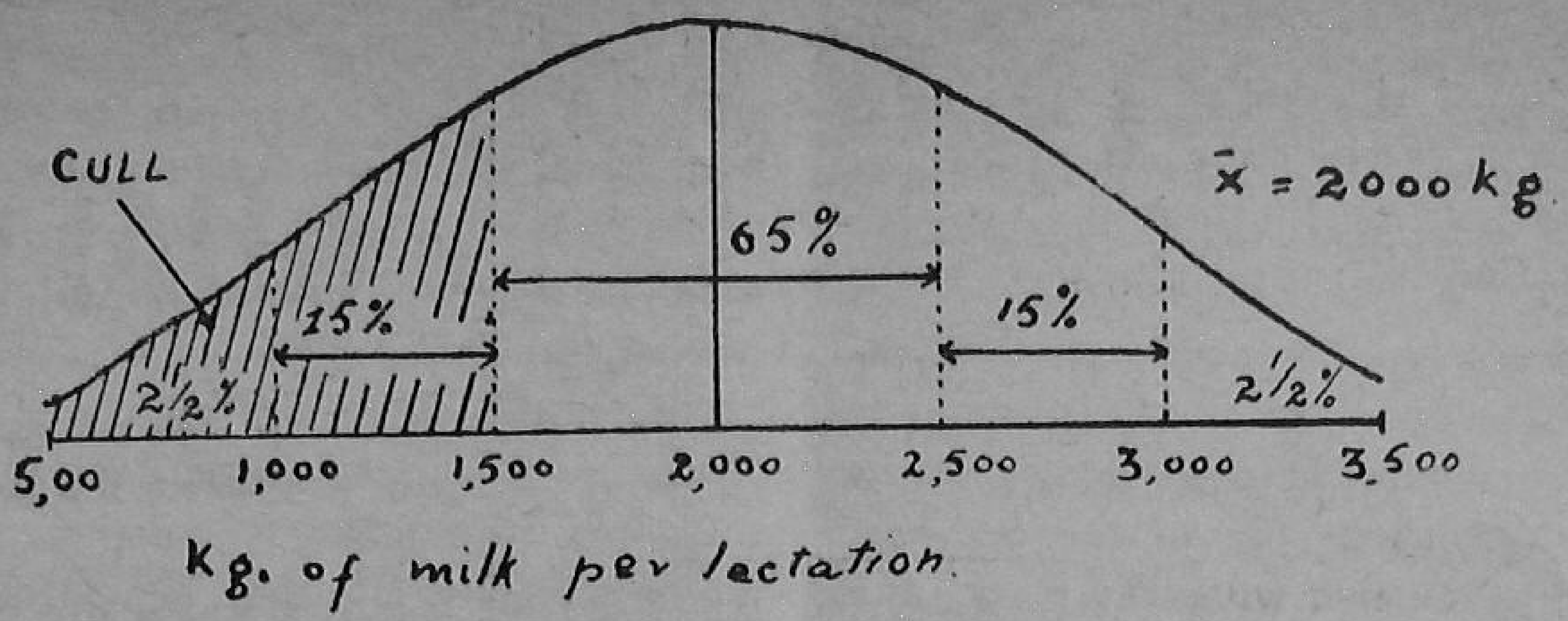
"Selective Breeding" within a Population:—Within a breed or a herd, often this is the form of breeding practised. This is essentially mass selection. The females to be retained for the breeding herd are chosen for their performance, usually based on first lactation production. Males for the herd are usually chosen on their dams performance. In herds with adequate facilities, often, the males are chosen on the performance of their sisters (sib-test) and/or on the performance of a small sample of unselected daughters (progeny test). In the case of selection of males, also, sometimes importance is given to the family from which they come. Barring these exceptions of rather small magnitude, the effectiveness of 'Selective Breeding' is essentially that of mass selection. Most economic characters are distributed in the form of a normal curve, which is characterized by the sketch given below. In the population, a great number of cows produce close to the average while a few are low producers and a few are high producers. A successful breeder identifies the low producers and eliminates them from the breeding population. The number that he can eliminate depends on the herd strength to be maintained, mortality in calves, productive life of adult cows, breeding troubles, etc. The parents chosen for producing the next generation invariably have a higher average production than the original unselected herd average. The difference between these two is known as Selection Differential. Only a portion of this Selection Differential is inherited by the offspring. The measure of the portion of the difference that is transmitted is known as heritability, which for milk production in cattle is estimated to be about 20-40 %. For instance, there is a population of cows with an average of 2,000 kg. of milk per lactation distributed as under: (See figure on the last page of the article.)

Under the conditions of maintaining constant herd strength, 10-15% mortality in calves, and 6 years as average productive life after first lactation, suppose it was possible to cull 18% of the cows based on their production, the range of selected cows will be, according to the normal curve shown above, from 1,500 kg to 3,500 kg. lacation production. The average of the 82% selected cows will be around 2,200 kg., i.e. the selection differential would be 200 kg. (2,200-2000 kg.). Taking heritability to be 30%, the performance of the offspring will be : 2,000 kg plus (200) (0.3) ie. 2,060 kg. Thus the subsequent generation average production will be 2,060 kg. of milk versus 2,000 kg. for the parental generation. Assuming the generation interval to be 5 years, one can expect to improve milk production to the extent of about 3% of the previous generation average. This illustration assumed that the improvement from the sire side and the dam side was the same. However, there is greater scope for improvement from the sire

side since it takes only a few bulls for a herd, which gives scope for a greater intensity of selection. The fact, that the bull does not give milk and his performance naturally will have to be judged from the performance of his relatives, brings, on the contrary, some inaccuracies. Taking all these into account, it has been estimated that one could expect an improvement of about 5% of the previous generations production per generation in a population subjected to mass selection. The herd that we took for illustration, with 2,000 kg of milk per lactation to start with, can at best be expected to have a genetic potential, after 25 years of selection (say, 5 generations), of about 2,600 kg. Thus, this is inevitably a slow process of improving milk production. Though the improvement is small under our conditions, in terms of Western dairying, where the average production is high, this method, which can be made a little more efficient by large scale use of proven bulls, has an important role to play. Under our conditions of poor yields, except for a few of the highly productive breeds maintained in Government Farms, there is little scope for achieving anything worthwhile through selective breeding. Our immediate aim should be first to raise radically the level of production, thereafter expect mass selection to maintain a steady but small improvement from generation to generation.

Grading—Cross breeding :—In terms of genetic consequences, these two systems of breeding are essentially the same. In the case of grading, bulls from a well defined highly productive breed are used on a non-descript population. In the case of crossbreeding, two well defined breeds are used, usually the bulls of the better producing breed are used on the female population of the poor producing breed. In our country often, crossbreeding connotes use of taurus (western breeds) on a zebu breed. The term grading denotes use of bulls from the better producing breed in successive generations so as to produce half breds, 3/4th grade, 7/8th grade and so on, ultimately the grade resembling the breed used, for all practical purposes, including milk production. Assuming for instance, a population of non-descript cattle is graded to say Red Sindi bulls for 3-4 generations then at the end, these grades will resemble and would be accepted as Red Sindhi.

In crossbreeding, the first step is to get a half bred having half foreign inheritance and half zebu inheritance. The half bred, under optimum feeding and management conditions, will perform a little above the average of the two parent populations. For instance, if Sahiwal cattle with a genetic potential of 2,400 kg of milk per lactation is crossed with Brown Swiss with a genetic potential of 4,400 kg. of milk, then the half bred, under optimum feeding and management conditions, will produce a little over 3,400 kg. of milk—say, 3,600 kg. The first figure, 3,400 kg. is the average of the two population averages $\left(\frac{2,400—4,000}{2}\right)$, which is the result of additive effect of the genes from the two populations. The increment of 200 kg. (3,600—3,400 kg.) is often termed as hybrid vigour. This increment is lost in course of future generations. If the desire is to maintain the additive gain obtained by crossbreeding, then the half breds should be considered as a new population and bred within the population. The average production (say 3,400 kg.) will be maintained from generation to generation. With proper selection practices, as indicated in a previous section, gradual improvement of 5% per generation



could be abtained over the new population average of 3,400 kg. However, if the desire is to further improve milk production radically taking advantage of the still higher production of the taurus breed and if optimum feeding and management conditions can be provided, the next step will be to mate the half bred cows to taurus bulls, producing 3/4 taurus—1/4 zebu inheritance. In the case illustrated, the performance of 3/4 Brown Swiss—1/4 Sahiwal, under optimum feeding and management conditions, will be 3,900 kg. of milk per lactation $\left(\frac{3,400..4,400}{2}\right)$, plus a little of the hybrid vigour retained. If it is desired to stabilise the new population at the level of inheritance obtained it could now be bred *inter se.* Thus the technique of crossbreeding for milk production is essentially to take advantage of the high milk production already obtained through generations of selection in the west and obtain half of the advantage directly in one generation by the use of a few imported bulls or import of frozen semen. What can be achieved in 50 years of selection in a Sahiwal herd for instance at the rate of 5% per generation through mass selection can be obtained in the same herd if half the inheritance could be supplied through bulls of taurus breed, in a matter of 5 years. Thus at the present juncture, depending on the ability to provide required optimal feeding and management conditions, grading and crossbreeding would have to play a vital role in cattle breeding in India, grading to utilize our better breeds in poorer milk producing tracts and crossbreeding where we want and can afford to maintain cattle much more productive than our best milk breeds.

Stock-owners please remember that :

QUALITY IS THE BASE OF PROSPERITY

Let the livestock owners fully realise that prosperity of the country is linked with the preservation and scientific development of cattle wealth, and as such, it is their national duty to improve the livestock and save it from the ravages and depredations of animal plagues.

For QUALITY Control INFECTIOUS DISEASES of Cattle

by

Shri J. M. Lall

ANIMAL plagues have not only been responsible for causing enormous monetary losses in India due to huge mortality among the livestock and the resulting serious set-back to the agricultural operations, but have also inflicted a crushing blow to the national economy by not allowing the animal industry to develop in this country on modern scientific lines. It is a matter of deep concern that the vital role that can be played by the livestock, particularly the cattle, in the prosperity of our country has not been appreciated in its proper perspective by a large section of our people. This accounts for the miserable fact that despite our land supporting more than one-fourth of the world's total cattle population, there is an acute shortage of dairy products, which should form a highly rich source of animal protein and fat in the daily rations. This, in turn, adversely affects the health of the people and saps the vitality of the nation. However, it is very encouraging to observe that improvement of livestock is now receiving urgent attention in the developmental programmes of our country. The control of animal diseases naturally occupies a very important place in all such schemes, because if the plagues are not properly controlled these might wipe away the good herds built after years of hard and strenuous efforts.

The researches carried out in the field of animal diseases have resulted in the evolution of a number of highly efficacious biological products for their control, and their judicious application can ensure safety of our livestock against depredations of several plagues. The control of some of the important infectious diseases caused by viruses and bacteria is discussed below:

Virus Diseases

(a) *Rinderpest:* (Sitla or Pakwa—Hindustani) :—This fell disease of cattle at one time was so highly devastating in its effects that it used to paralyse year after year the agricultural operations in large areas of our country. In the 1860's, it was killing nearly 10 lakhs of cattle every year. However, as a result of extensive investigations carried out at the Indian Veterinary Research Institute, Edwards (i) (1926) evolved a highly efficacious and a cheap vaccine (Rinderpest goat-adapted virus vaccine, popularly known as G.T.V.), a single injection of which produces life long immunity. The cost of production of this vaccine is as low as 2 nP. per dose. This vaccine cannot, however, be used with

safety on highly susceptible European and cross-bred cattle and some hill-breeds as well as on the animals in advanced pregnancy. As such mass vaccination programmes throughout the country with a view to eradicate the disease could not be undertaken till some milder vaccines like lapinised and lapinised-avianised became available. *Fig. I.* Characteristic mouth lesions in rinderpest.

The studies carried out with the lapinised vaccine have shown that the product is safe for all breeds of cattle including animals with foreign blood. Immunity following its use has so far been tested for a period of 7 years and found to be solid. Similarly, the lapinised-avianised vaccine, which is a still milder product, has been found to confer protection for at least 5 years, the maximum period for which tests had been carried out till 31st March, 1962. The cost of production of this vaccine is less than even 1 nP. per dose.

Having developed all the weapons needed to fight against this scourge, a mass vaccination campaign was launched by the Govt. of India on the 1st of October, 1954, with the ultimate object of eradicating rinderpest from this country. The work so far is progressing very satisfactorily and by the end of March, 1962, as many as 1079.07 lakh animals had been vaccinated. This scheme of large scale immunization has considerably reduced the losses due to rinderpest and it seems that the disease will soon be eradicated from India.

(b) *Foot-and-Mouth Disease*: (Munh Khur—Hindustani) Wide-spread outbreaks of this disease occur throughout the country and according to Dhanda and Gopalkrishnan[2] (1958) the annual national loss due to it is not less than 40 million rupees. This plague, as it occurs in India, is not very fatal but it incapicitates such a large number of animals that agricultural operations are seriously hampered. Further, it causes considerable decrease in the milk yield of affected cows and buffaloes. *Fig. 2*—Characteristic mouth lesions of foot-and-mouth disease. Ulcers on the tongue.

Note:—Vesicular lesions which quickly rupture to form ulcerated areas are also observed on the coronary margins of the hoofs.

The vaccines developed so far against this disease do not confer a lasting and durable immunity and the cost of their production is comparatively very high. Moreover, large-scale manufacture of foot-and-mouth disease vaccines in countries like our's, where the disease is wide-spread, is beset with a serious difficulty as tongue epithelium from animals, which should not have got natural infection earlier, is hard to obtain in large quantities.

The crystal violet vaccine that is being produced at present at the Indian Veterinary Research Institute has been found to give immunity upto about 17 months (Dhanda *et al*[3], 1958). However, due to non-availability of susceptible cattle in large numbers, it cannot be manufactured on a large scale. Moreover,

Fig. 1 : Rinderpest

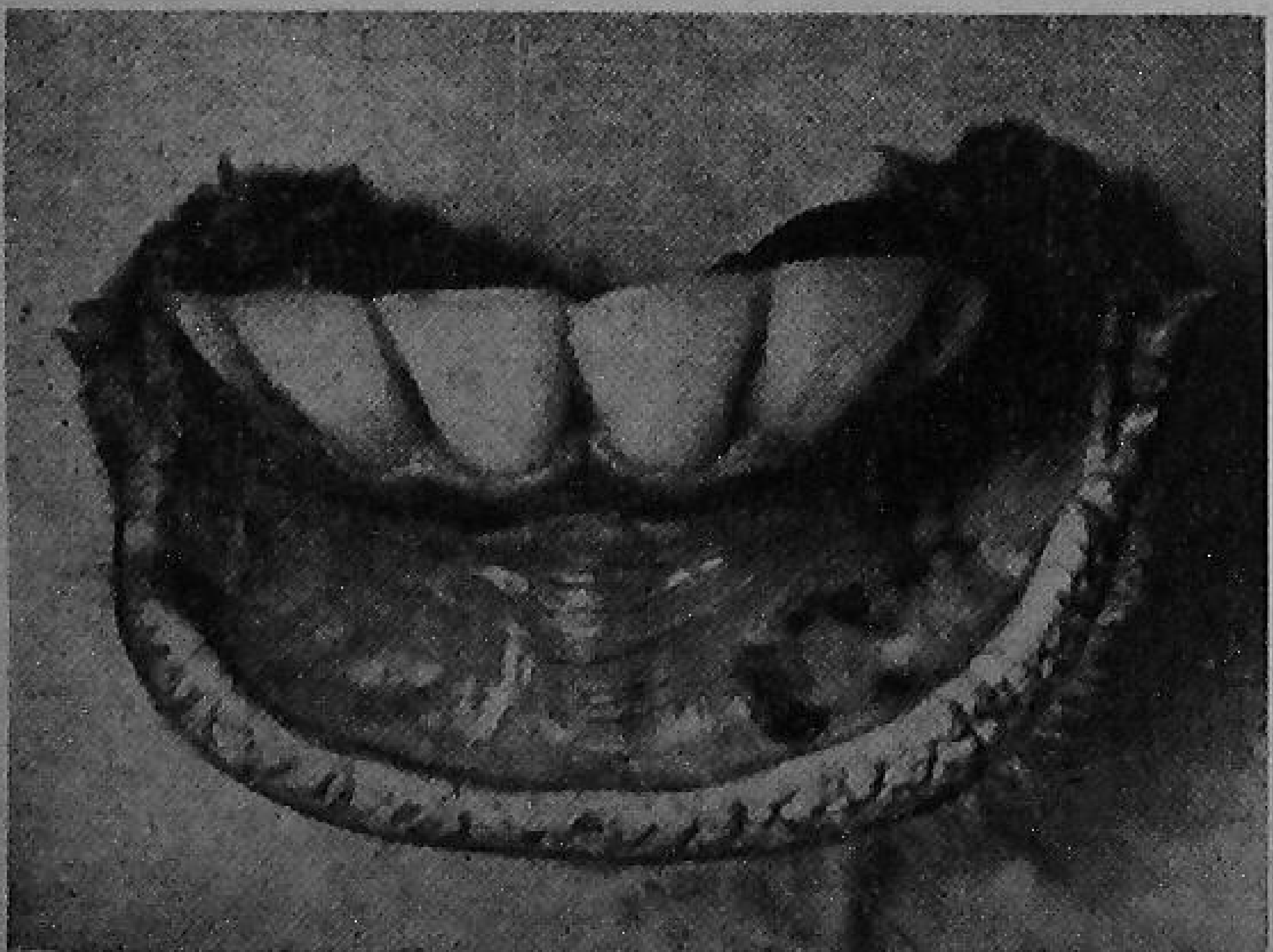
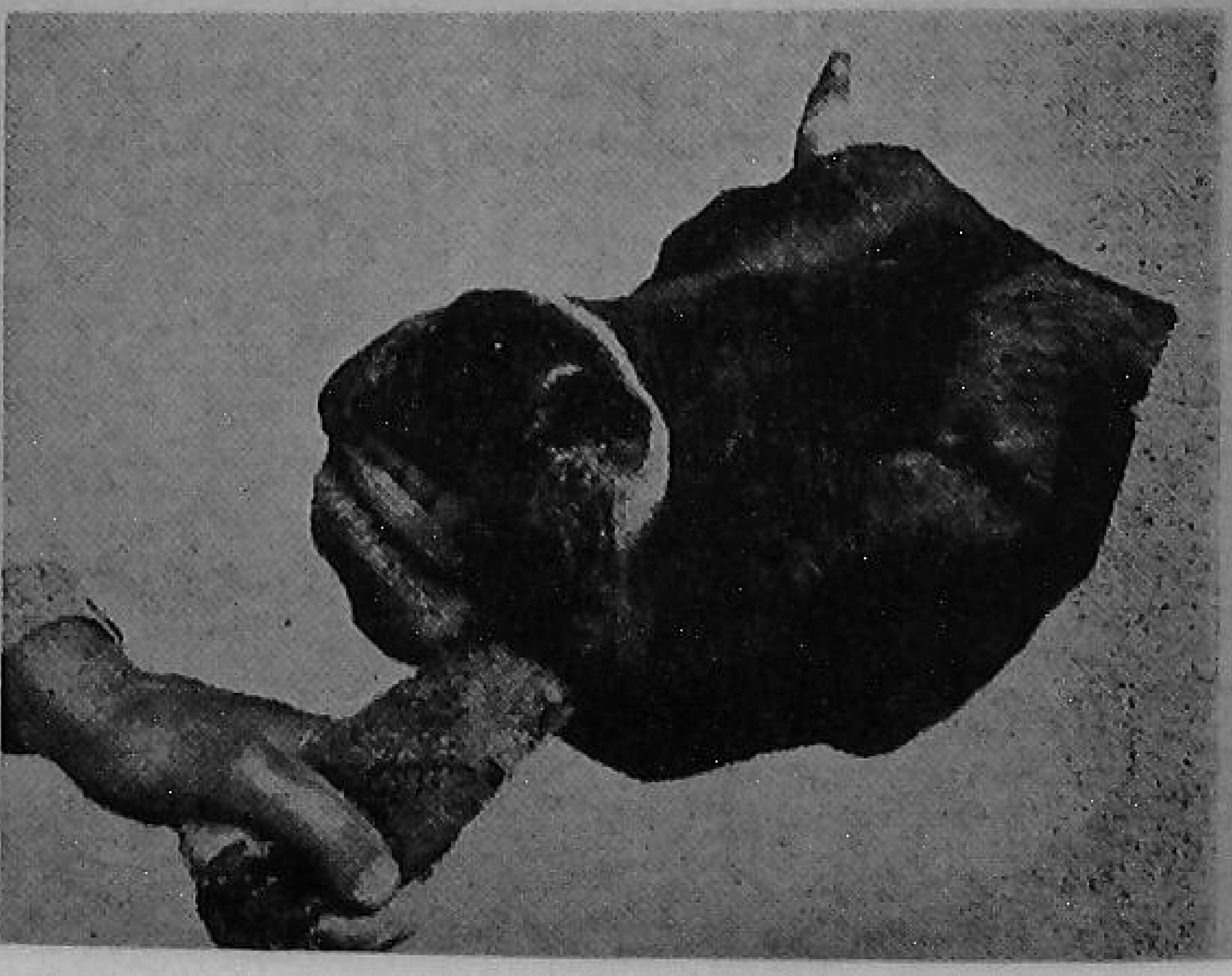


Fig. 2 : Foot-and-mouth disease



as its cost of production is very high (Rs. 8.96 nP. per dose) and the immunity produced is for less than 18 months, its use for mass vaccination cannot be considered a practical proposition. Extensive investigations are, therefore, being carried out at the Indian Veterinary Research Institute and other Institutes in different countries engaged in research on foot-and-mouth disease, for evolving a cheap live vaccine that may be capable of conferring lasting immunity. Till such time that a satisfactory vaccine becomes available, it is difficult to do anything very much by way of controlling the disease except to aphthise the animals in the locality where the disease may break out so as to cut short the duration of outbreak.

The affected animals require a lot of good nursing and hygienic care so that secondary complications may not arise. Particular attention has to be paid to the food, which should be soft and nutritious. Thin rice gruel mixed with two or three ounces of gur or treacle alternated with bran mash containing a little common salt should be fed once a day in addition to *ad lib* supply of tender green fodder. The diseased animals, especially those having foot lesions should not be allowed to stand on dirty and wet ground. The premises should be kept scrupulously clean and dry, and free from flies.

Bacterial Diseases

These may, for convenience of description, be divided into (A) Acute diseases; and (B) Chronic diseases.

A. Acute diseases

(a) *Haemorrhagic septicaemia* (Pasteurellosis): (Ghotu; Gulghotu; Ghotwa—Hindustani names). This very serious disease of livestock is responsible for the death of more than 40,000 cattle and buffaloes every year in this country, inflicting a national loss of nearly 10 millions of rupees per annum.

In endemic areas, a large number of outbreaks occur with the starting of the monsoon and the winter rains, which till recently used to wipe away a large number of animals. However, it is very encouraging to report that a highly efficacious oil-adjuvant vaccine was developed at the Indian Veterinary Research Institute during the year 1953 (Dhanda *et al*[4,5,6,7] 1956, 1958, 1959, 1960) which has been tried on an extensive scale in this country and found to be absolutely safe for cattle and buffaloes of all ages. The immunity following its use has been tested upto 27 months and found to be solid. By now several lakh doses of the oil-adjuvant vaccine have been used in this country with excellent results.

With the evolution of the oil-adjuvant vaccine, the control of haemorrhagic septicaemia has become a practical proposition and now all the cattle and buffaloes in endemic areas should be vaccinated every year without fail before the onset of monsoon rains. Mass vaccinations in non-endemic areas need not be carried out as this likely to prove un-economical. The sporadic cases should be treated with sulphamezathine sodium 33⅓ per cent. solution.

(b) *Blackquarter* (Zaharbad—Hindustani): Blackquarter is responsible for nearly 21,500 deaths in cattle every year. The disease mainly affects the young animals in good health. Nilakantan[8] (1954) analysed State-wise the data in respect of outbreaks and found that nearly 85 percent of the outbreaks occurred in the State of Madras, Bombay, Mysore and Hyderabad while only 15 per cent occurred in rest of the country.

Animals in endemic areas should be vaccinated with a formalised whole culture vaccine being prepared at different production centres in the country. Treatment of sporadic cases with antibiotics like penicillin has given encouraging results.

(c) *Anthrax* (Goli—Hindustani name):—This disease, which is responsible for an annual mortality of about 5,00[illegible] cattle and buffaloes every year, occu[illegible] throughout the country. There h[illegible]ever, appear to be endemic areas wh[illegible] it is more prevalent. *Fig. 3*—Anth[illegible] case.

Note: the blood-stained discharges from th[illegible]

nostril and anus and the bloating of the carcase.

This disease runs a very acute course and the animal may be found dead without any noticeable illness. The carcase of an anthrax case should never be opened as the bacteria causing the disease on exposure to air will form highly resistant spores which may survive in the soil for years together. This disease is picked up by animals while eating food infected with the anthrax germs.

Annual prophylactic immunization of animals is recommended only in endemic areas. The anthrax spore vaccine (live) used in this country gives protection for a period of about one year. The cases in early stages have been found to respond fairly well to treatment with sulfadiazine and penicillin.

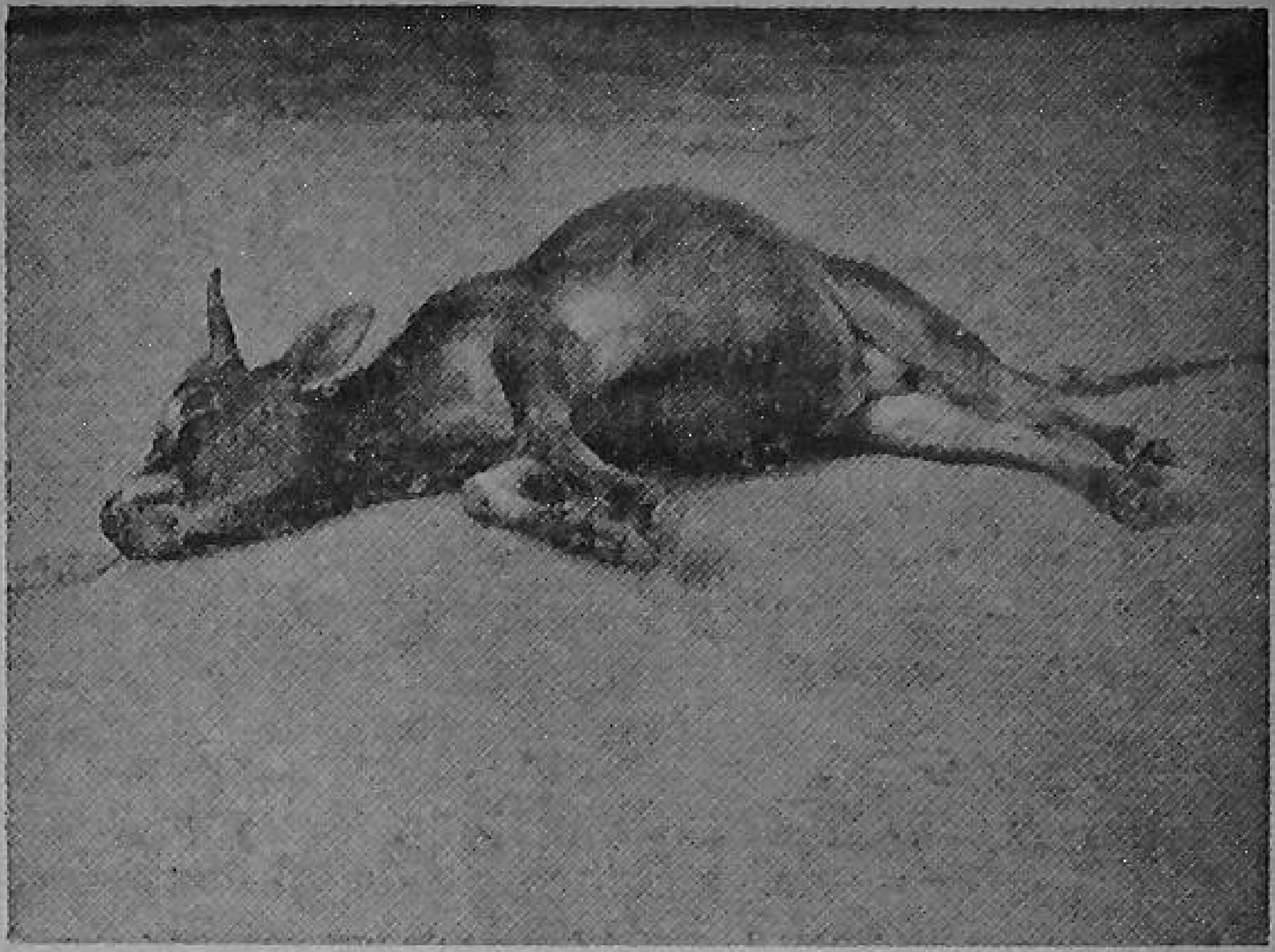


Fig. 3 : Anthrax case

B. Chronic Diseases

With the developing of the dairy industry and the consequent herding together of animals, the seriousness of diseases like tuberculosis, Johne's disease, mastitis, brucellosis, is belng increasingly felt. It is, thorefore, highly important that effective steps should be immediately taken to control these infections on a country-wide basis so that these may not get so deep-rooted that their eradication may become an extremely difficult problem entailing huge economic losses to the country.

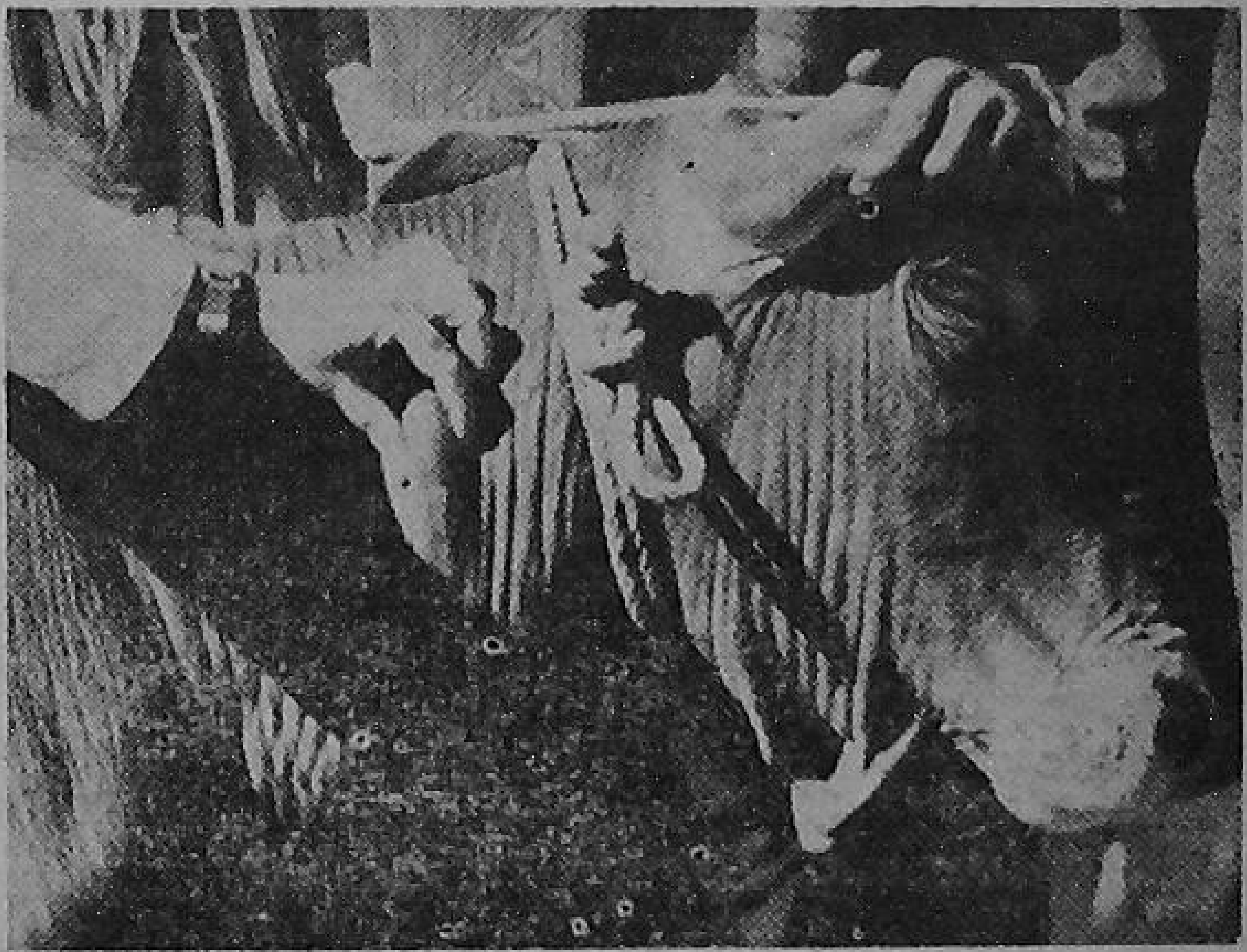


Fig. 4 : Tuberculin test

(a) *Tuberculosis* (Tapdik—Hindustani)—As a result of mass tuberculin tests, it has become abundantly clear that the incidence of tuberculosis infection in cattle in certain areas is fairly high. In a few herds of the country, the percentage of reactors has been found to be as high as 30 to 85 per cent. The results of the surveys carried out in the States of the Punjab, Bombay, Madras and Bihar are given in the table at the end.

Note : The surveys were carried out under the aegis of the Indian Council of Agricultural Research.

It is interesting to observe that in each of . above four surveys the incidence of tuber-ıin reactors was higher in buffaloes than in ttle.

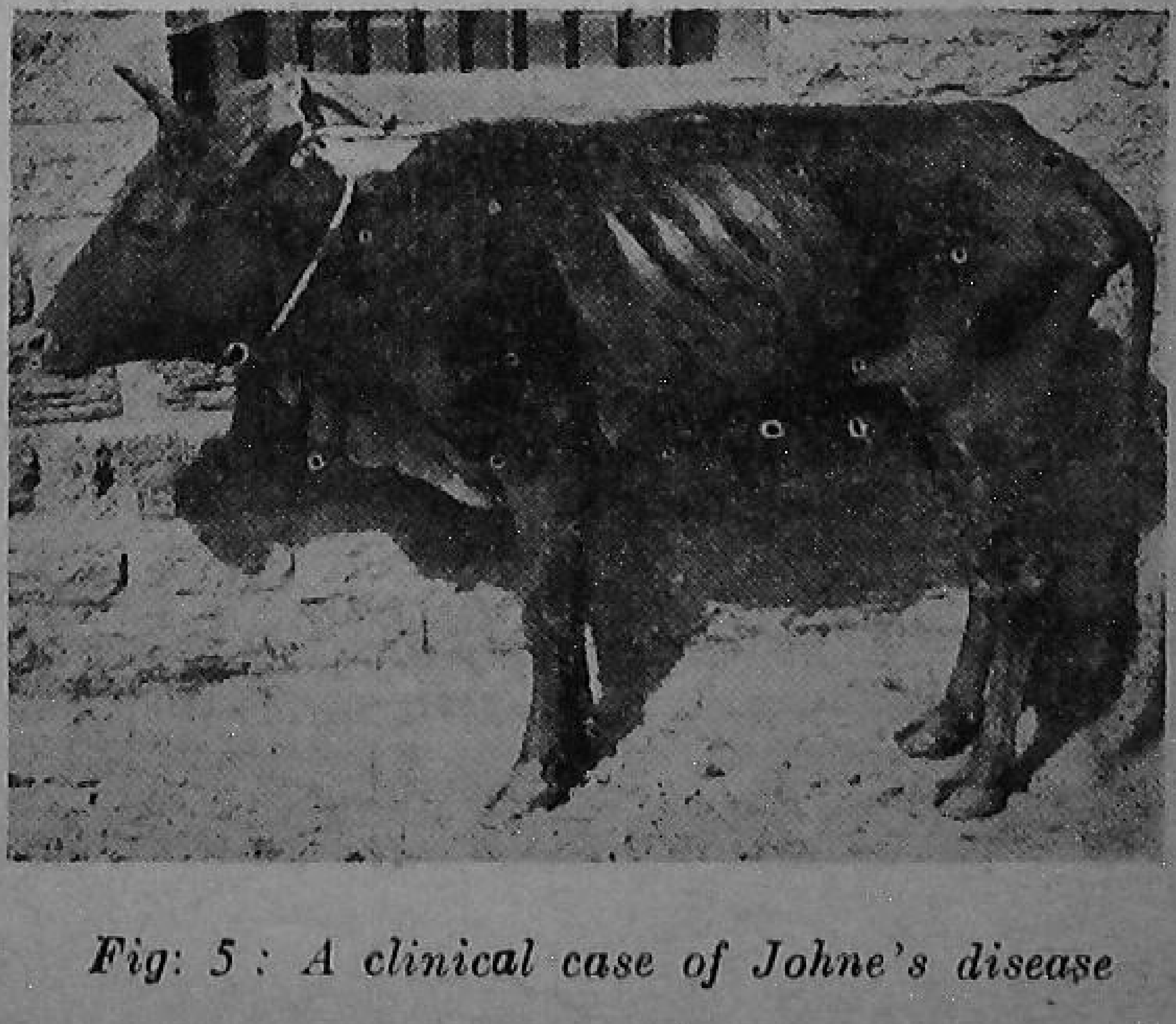


Fig: 5 : A clinical case of Johne's disease

The eradication of tuberculosis from farms when once it gets established is extremely difficult. It is, therefore, necessary that all steps should be taken to prevent the entry of infection and for that reliance should be placed on the tuberculin test which has been found very reliable in picking up case of tuberculous infection. The positive animals should be disposed of according to the advice of a qualified veterinarian. (*Fig. 4* Tuberculin test)

In view of the serious threat imposed by tuberculosis to the developing dairy industry of our country, a scheme has already been formulated with the objective of building up clean herds and later clean areas by following 'test and segregation policy' with destruction of clinical cases of the disease, where possible. This plan of eradication appears to be more suited to the needs of our country as it is likely to prove economical in the long run. The 'test and slaughter' policy followed by Finland, U.S.A. etc. has not been considered practicable for adoption in India as apart from religious sentiments against the large scale destruction of cattle, it will result in considerable reduction of working bullocks as well as milch cattle, which the country can ill-afford. Moreover, since the disease in our cattle under the Indian conditions has been found to be of not of a very progressive type, the destruction of tuberculin reactors, which may continue to live a useful life for years together appears to be a wasteful plan.

It is heartening to note that tuberculosis from cattle has already been successfully eradicated from several countries, like U.S.A., Finland, Guernsey, Denmark, Great Britain Luxemburg, the Netherlands, Norway, Sweden and Switzerland.

(b) *Johne's Disease :* From the surveys carried out so far, it has already become quite clear that the foci of infection of this chronic wasting disease are spread all over the country and that certain herds are suffering from heavy losses due to this scourge : *Fig. 5*—A clinical case of Johnes disease.

Note : marked emaciation—Animal suffers from intermittent diarrhoea passing frothy faeces containing particles of mucus.

The control of Johne's infection when once it gets established in a herd is extremely difficult as the diseased animals void a very large number of organisms in their faeces and thus contaminate the pastures, fodder supply and at times drinking water, too. It is, therefore, highly important to prevent its entry into farms for which reliance may be placed on purchasing animals from certified disease-free herds. However, if animals with unknown history mnst be accepted, these should be got tested with johnin by a qualified veterinarian and should be purchased only if found negative. However, before mixing with the main herd, such animals after being kept in quarantine for a period of two or three months should be got re-tested with johnin.

(c) *Mastitis* :—This very serious disease of milch animals is present in an insidious form in most dairy herds of our country. It is caused by several types of micro-organisms, the most important being the pathogenic staphylococci and streptococci. (*Fig. 6.*—clinical case of Mastitis).

Note the characteristic inflammation of the udder.

According to the survey carried out by Sethi[9] (1953-1959) who examined 895 cows and 690 buffaloes in nine dairy herds located in the different states, the incidence of subclinical cases was as high as 43.6 percent in cows and 20.7 per cent in buffaloes as against 3.9 per cent and 2.4 percent of clinical cases in cows and buffaloes respectively.

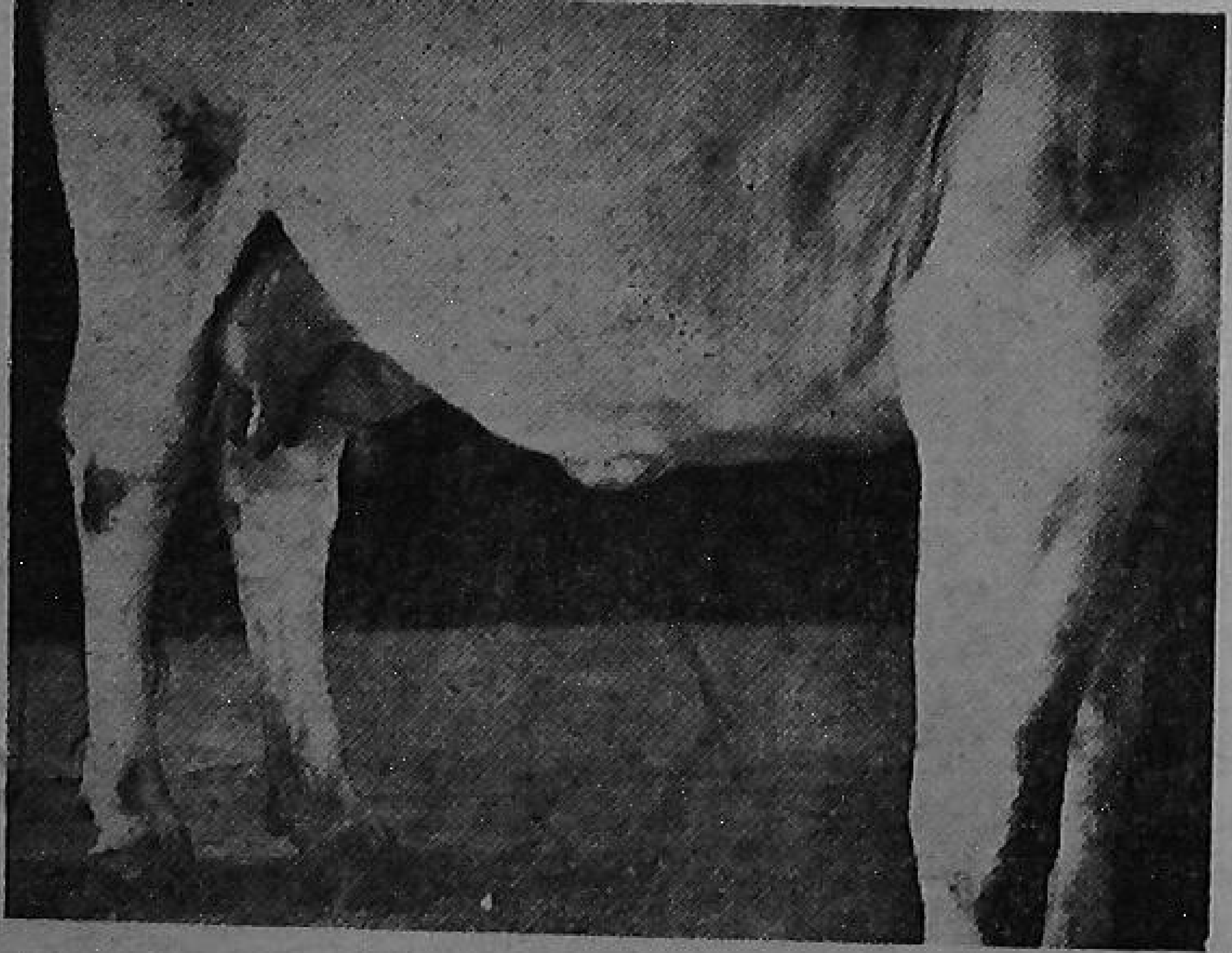
The investigations carried out under the aegis of the I.C A.R. in the States of the Punjab, Mysore and Bombay[10, 11, 12] have also revealed that mastitis is a problem in this country. At the Mastitis Centre, Punjab, 9.1 per cent out of 3097 cows and 8.1 per cent out of 1198 buffaloes examined during the year 1952-55 were detected as clinical cases and on cultural examination of 1524 milk samples as many as 34.4 per cent were found positive for mastitis organisms. At the Mastitis Centre, Mysore, 31.3 per cent out of a tota of 2246 animals examined during the yea 1950-1956, were found positive cases of t disease. The results of cultural examinati of the udder secretion of 2492 cows ar buffaloes (1951-56) at the Mastitis Centr Bombay, revealed 19.7 per cent were infecte with the mastitis organisms.

It should be fully appreciated that the incidence of mastitis in herds with bad management and sanitation is much higher than in those where hygienic measures are practised. In this connection, it may also be stressed that there are several contributory factors which tend to lower the normal resisting power of the udder tissues and thus create condition favourable for invasion by the micro-organisms. Some of the important predisposing factors are mechanical injury to the mammary gland, contact of the udder with wet and cold floors for long periods, incomplete milking, rough handling of the udder, faulty technique in milking such as application of un-even pressure on the teats, wrong use of milking machines etc.

In the light of what has been stated above, it is highly important that all hygienic and sanitary measures should be taken to prevent dissemination of infection. For example, the udder and teats of each cow before milking should be washed with water and dried with a clean towel or piece of cloth, and that the milker should wash his hands with soap and water before he milks any cow. Further, it should be ensured that a person who milks any mastitis case should not be allowed to milk healthy animals. Care should also be taken not to expose the animals to pre-disposing factors.

The animals suffering from mastitis should be segregated and got treated by a qualified veterinarian.

Fig 6: Mastitis



(d) *Brucellosis* (Contagious bovine abortion). With intensive methods of domestication of cattle in the absence of correspondingly improved standards of hygiene, this disease is increasing day by day in its importance. Thus, Nandi[12] (1958), who subjected 1072 serum samples collected from cows, buffaloes and calves in Calcutta Khatals to agglutination test, found as many as 173 (i.e., 16.1 per cent) positive for Brucella infection.

The most important symptom of this disease is abortion or premature birth but some animals may be able to carry their young ones to full term without raising any suspicion of the presence of infection. As such, it is important to request the local veterinarian to examine the herd occasionally and to subject serum samples of the animals to agglutination test.

Control of this disease rests chiefly on the adoption of hygienic measures. However, in the farms where the incidence of the disease may be very high and the herd may be passing through an abortion storm, vaccination with an avirulent live vaccine may be undertaken along with the adoption of strict sanitary methods of control with the ultimate object of building up clean herds. However, all the vaccination work will have to be carried out by a qualified veterinarian and the hygienic measures recommended by him should be strictly followed. Once the herd becomes free from infection and in the case of herds which are already clean or the incidence of the disease is low, no fresh animal should be introduced without getting it examined from a qualified veterinarian regarding its freedom from Brucellosis.

General Recommendation

The golden rule for prevention of infectious diseases, like rinderpest, haemorrhagic septicaemia, blackquarter, anthrax, is to resort to timely vaccination of all the susceptible animals in endemic areas. It will be gratifying for the general public to know that vaccination work is done free of charge by the government veterinary surgeons and even the cost of the vaccines, sera etc. is borne by the State. As such, the cattle owners in their own interest as well as of the other livestock owners should get their animals vaccinated in time.

TABLE

Name of the States	Areas of the State where tests were carried out.	Year of test	CATTLE			BUFFALOES		
			No. tested	No. of positive reactors	Percentage of positive reactors	No. tested	No. of positive reactors	Percentage of positive reactors
1	2	3	4	5	6	7	8	9
Punjab (undivided).	City of Lahore and the area within a radius of about 12 miles.	1946-1947	6521	1061	16.3	5558	1404	25.3
Bombay	City of Ahmedabad and the area within a radius of about 16 miles.	1947-1948	3550	431	12.1	21,592	3761	17.4
Madras	City of Madras and the area within a radius of about 16 miles.	1950-1951 & July, 1955 to Nov. 1955	19743	353	1.8	7,685	213	2.8
Bihar	City of Patna and the area within a radius of about 13 miles.	1952-1953	14705	232	1.6	5,368	175	3.3
			44,519	2,077	4.7	40,201	5,553	13.8

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FEED WELL for OPTIMUM PRODUCTION

by : **Dr. S.N. Ray**

THE optimum production of milk by a cow depends equally on its productive capacity and on the feeds and care which it receives. Just as one cannot increase the total milk yield of an inferior cow through liberal feeding, equally true is the fact that undernutrition in a potentially good cow, does not enable it to give full play to its inherited capacity for milk production.

In formulating a ration for a cow in milk it may be remembered that a large portion of the nutrients, supplied through the ration, is required for its maintenance i.e. to help it to carry on its essential processes of life such as breathing, circulation of blood, maintenance of body temperature, and for the repair of the daily wear and tear of body tissues. This requirement is dependant to a certain extent on body weight, though not exactly proportional to it. Nutrients, supplied in the ration, over and above the maintenance requirement, can be converted by the cow to milk. The amount of such extra nutrients to be supplied will vary from cow to cow depending on the amount of the milk secreted by individual animals whose maintenance requirements will, however, be the same, provided these are of similar body weights. Thus a cow giving 20 kg. of milk will not require twice the amount of nutrient as compared with one of the same body weight giving 10 kg. of milk. For example, the daily maintenance requirement of a cow of 400 kg. body weight can be met by feeding 20 kg. of green maize. An animal giving 10 kg. of milk containing 4% fat will require an additional 4 kg. of a concentrate mixture, while a cow giving 20 Kg. of milk

of similar fat content needs 8 kg. of concentrate mixture. The cost of feeding in the first instance will be Rs. 1.50/day while that for the latter is Rs. 2.50/day. The proportion of cost in feeding for the maintenance of the first animal of 10 kg, milk yield, will be 33% while that for an animal with twice the milk yield will be 20% only. This example serves to illustrate two main points, firstly that each cow should be fed individually according to its milk yield, and secondly that it is much more economical to have high yielding cows.

Selection of well balanced rations:—

A balanced ration is one which supplies the animal with all the essential nutrients in quantities just sufficient for its maintenance as well as for any production. In order to compute a ration the following facts should be known. (1) Body weight of the animal (2) the milk yield and (3) whether the animal is pregnant or not. If the milch animal is a heifer and has not completed its growth period, that fact should also be kept in mind. With all these infomations as the background, the requirements (1) of digestible protein (2) of total digestible nutrients which supply energy for the essential processes for life as well as milk production and (3) of essential minerals and of vitamins can be calculated from tables of requirements which have been drawn up on the basis of well controlled experiments and are available in any text book of nutrition. For Indian cattle, the most useful compilation of data has been made by Sen (1957) and that bulletin must be consulted by all who want to take care of their animals on a scientific basis. An abridged table of requirements for different categories of animals is given in Table 1. Table 2 shows the nutritive value of some common feeds as fed to animals.

For drawing up a balanced ration, it must be remembered that the dry matter intake of animals is between 2 to 2.5 kg. per 100 kg. body weight. Milch animals can consume a little more food. From these data as well as the computed total requirement of nutrients, a balanced ration can be formulated from the available feeds. Usually two-thirds or more of the dry matter intake comes from roughages. It is also essential that at least 7-10 kg. of green feeds are offered to each animal so that the requirement of calcium and vitamin A may be amply met. The inclusion of green feeds also tend to make the whole ration more palatable and thus helps in fuller consumption of feeds. The rest of the required nutrients is generally supplied through a concentrate mixture. The following example illustrates the procedure of computing a balanced ration :—

Suppose the cow is of 450 kg. body weight and has a milk yield of 10 kg. with 4.5% fat content. The available feeds are (1) wheat bhusa (2) green maize (3) oats (4) gram (5) wheat bran and (6) Groundnut cake. From table 1, we see that the requirement of nutrients of the animal is as follows :—

	kg. D.C.P.	kg. T.D.N.
Maintenance requirement.	0.28	3.37
For 10 kg. milk (4.5% fat).	0.48	2.95
Total daily requirements.	0.76	6.32

The maintenance requirement is met by the following feeds :—

	Dry matter kg.	D.C.P. kg.	T.D.N. kg.
Green maize (10 kg).	2.5	0.12	1.7
Wheat bhusa (4 kg).	3.6	0.00	1.7
Groundnut cake (0.5 kg).	0.4	0.21	0.3
Total :—	6.5	0.33	3.7

The requirement for milk can be met by 4 kg. of concentrate mixture (1 kg. for every 2½ kg. of milk) consisting of oats-40 parts, gram chuni-30 parts, groundnut cake-20 parts and wheat bran-10 parts. Each kilogram of this concentrate mixture contains 0.15 kg. of D.C.P. and 0.70 kg. of T.D.N., so that total feeds and nutrients intake become as follows:—

	D.M. kg.	D.C.P. kg.	T.D.N. kg.
Basal ration for maintenance.	6.5	0.33	3.7
Conc. mixture (4 kg).	3.6	0.60	2.8
Total intake.	10.1	0.93	6.6

As the intake of dry matter of a 450 kg. body weight milch animal will be between 10 to 12 kg., it will be seen that the above quantity of feeds which can be easily ingested by the cow in the example, would supply the requirements, except sodium and chlorine, which can be met by giving an extra 50 kg. of common salt per day.

Give the young calf a good start in life :— One of the common causes of the degeneration of cattle is the retardation of growth in young calves through faulty nutrition. A fact which is usually overlooked is that the young heifer of today is the cow of tomorrow. Like all young animals, calves require a relatively large proportion of protein, energy and minerals for their optimum growth. This is illustrated in table 1, yet most often, the calves are usually left to fed for themselves on whatever grazing they get and little or no supplemental feeding is practised. The result is that their growth is stunted and the age of maturity is grossly delayed. The common village animal calves at the age of 4 years or so, wheras through judicious feeding and care they can be made to calve as early as 2½ years of age. Underfeeding in early life may also damage the productive organs, so that the mature animal may not be able to give the full play to its genetic ability for milk production. The cost of proper rearing of calf is rather high;' but if this is viewed in term of life time production, the extra investments during the first few years of its formative life will amply be repaid in later years.

The care of a calf should start even before it is born. The ration supplied to a pregnant dam should provide not only its maintenance requirements, but also the extra nutrients for the growth of the foetus. As the development of foetus is rather rapid during the last three months of pregenancy, an extra quantity of 1 kg. of concentrate mixture should be provided to the pregnant cow, over and above its maintenance requirement. Such supplemental feeding will enable the cow to bring forth a healthy and strong calf.

After its birth, the calf should be given colostrum for the first three days. This first milk contains substances useful for the health of the calves. After this period, the calf should get whole milk at the rate of 1/10 of its body weight for at least a month or preferably two months. The milk quota, usually starting with 2½ kg. a day is increased to 3½ kg. a day at two months of age and should be given in three or four feedings. If the calf is suckled, care must be taken to see that it gets the requisite quantities of milk through such a method. After two months the whole milk quota may be reduced gradually by either skim or butter milk so that by the end of three months, whole milk may be entirely withdrawn. As skim milk contains less energy than whole milk, supplemental feeding of a concentrate mixture should be started from 1 month of age. The amount, which may be only handful a day in the beginning, is to be raised to 1.5 kg.

by about six months of age. From the 4th month of age, the quota of skim milk is gradually decreased and of the concentrate mixture increased, so that by the time the calves are six months old, they can subsist mainly on solid feed. Good hay should be given from one month of age or even earlier. Green fodder can be added slowly to the ration, after the calf is 2-3 months old.

Raising dairy heifers.

From six months of age, until the time they calve, the heifers should be fed a ration of roughage and concentrates in proper amounts so that their requirement for optimum growth is met. From six months to two years of age, an average calf requires at least 5-10 kg. of good quality green fodder and about 2 kg. of concentrate mixture plus as much quantity of hay or bhusa it can eonsume. If leguminous green feeds or hay are available, the amount of concentrate mixture to be supplied may be reduced at the rate of 10 kg. of green legumes or 2 kg. of leguminous hay for every one kg. of concentrate mixture. The ration fed should be such as to produce a growth rate of 1/2 kg. a day in large sized animals i.e. of Sahiwal, Tharparkar, Harriana and Gir breeds. Calves of breeds, which have a lower adult body weight, may be given correspondingly less feed. Provided proper care in management is taken, there should be no reason why the heifers should not develop into profitable cows. Indeed one can say 'Take care of your calves and your profits will take care of themselves'.

Feed the dry cow properly :—

Proper feeding during the dry period is important to condition the animal for stresses it will have to bear during lactation. If the animal is in calf, it should be dried at least 2 months before calving and given a ration which will supply its requirement both for maintenance as well as foetal growth. If the cow is a heavy yielder, it will be judicious to feed even a little more concentrate say an extra 1 kg., during the dry period than what is usually required so that it can recoup the body losses incurred during the previous lactation. This process, which is called 'Steaming up' has been found to be very effective in ensuring persistant milk yield from lactation to lactation in high producing cows. Even if the cow is not pregnant, its feeding should not be neglected, so that its onset of heat and subsequent successful mating, is not delayed through lack of proper nutrition.

Feed judiciously but not extravagantly :—

A final word of caution may be added against the hazards of over-feeding. A cow should be fed according to its requirement. Any extra feed will only go to fatten the animal. Not only does over-feeding add unnecessarily to the expenditure but may also cause breeding trouble which may ruin a good cow. Excess of anything is bad and that holds good for feeding of cows as well.

In conclusion, it is once again stressed that if we want the cow to give its best, it should be fed properly from the time of its birth or even earlier and throughout its productive life. Neglect in doing this will render it unthrifty and hence uneconomic, as is the case of majority of the animals in this country. It has been shown that even under village conditions, nondescript cows, when given balanced rations, have shown an increase of87% in the milk yield with a corresponding decrease of 35% in the cost of milk production. This shows that given proper conditions, our cattle can give a much more creditable account of themselves than what is the picture now.

TABLE 1

Nutritional requirements for dairy cattle

		kg.		grams.	
	Body weight.	D.C.P.	T.D.N.	Calcium	Phosphorus.
Growing calves.	45	0.15	0.8	7	6
	100	0.28	1.9	13	10
	200	0.40	3.0	13	12
	3 0	0.47	4.0	13	12
Mature cows (Maintenance)	250	0.17	2.0	6	6
	350	0.23	2.6	8	8
	450	0.28	3.4	10	10
Lactating cows (add to maintenance per kg. of milk). Fat level of milk.					
	3%	0.018	0.122	2	1.5
	4%	0.020	0.144	2	1.5
	5%	0.023	0.165	2	1.5
	7%	0.029	0.208	2	1.5

TABLE 2

Nutritive values of some common feeding stuffs are offered to cattle.

Name of feed	Digestible crude protein %	T.D.N. %	Calcium %	Phosphorus %
1. Paddy straw	0.00	40.0	0.33	0.07
2. Wheat straw.	0.09	43.0	0.30	0.07
3. Ragi straw.	0 21	50.0	0.80	0.16
4. Jowar Kadbi	0 58	45.0	0.33	0.14
5. Green berseem.	2.67	11.5	0.32	0.06
6. Guinea grass.	1.11	12.8	0.08	0.04
7. Green jowar (young).	0 34	11.6	0.17	0.10
8. -do- (prime).	0 50	16.7	0.13	0.03
9. Green maize	1.17	17.0	0.13	0.07
10. Barley grain.	7.10	75.0	0.07	0 28
11. Oats ,,	7.07	70.6	0.12	0.33
12. Maize ,,	6.30	76.6	0.02	0.37
13. Gram chuni.	12.00	74.0	0.40	0.20
14. Cottonseed.	11.24	80.0	0.23	0.50
15. Rape cake.	27.83	78.0	0.29	0 39
16. Groundnut cake	41.75	71.0	0.08	0.23
17. Cottonseed cake.	17.47	72 0	0.11	0.53
18. Gram husk	0.00	55.0	0.12	0.04
19. Wheat bran.	9.22	65.5	0.07	0.35
20. Rice bran.	7.13	63.5	0.06	1.12

The approximate dry matter contents of feeds are as follows :—

(i)	Straws, hays, grains, brans, oilcakes.—	90%
(ii)	Green jowar, green maize, green grass.—	25%
(iii)	Green legumes like berseem and lucerne.—	20%
(iv)	Prime jowar.	35%

ANIMAL CLIMATOLOGY as an aid to the development of HIGH QUALITY CATTLE

by

Mr. James E. Johnston

ANIMAL Climatology is one of the new branches of the science of Animal Production which has been developed as a result of recognition of the importance of climatic animals.

In India, cattle serve the dual purposes of draft and milk production. Traditionally the greatest emphasis has been placed on their draft capacity, although interest in improving their ability to produce milk has developed rapidly in recent years. Thus, the term "Quality Cattle" might be defined as referring to cattle which, while continuing to provide the necessary draft capacity, are able to produce milk efficiently and at economic levels. In other words, a cow should produce enough milk during her lifetime to repay the cost of feed she has consumed, as well as the cost of labour needed to rear and milk her. Climate is an important factor in determining the level and efficiency of milk production of cattle because of its effects on the well-being of the cow, as well as on the growth of crops needed to feed her, and the frequency of disease and parasites. In order to produce milk effectively, cattle must be healthy, and must be provided with ample quantities of feed which supply all of the required elements.

The Indian Government, with assistance from the Food and Agriculture Organisation of the United Nations and the PL 480 Programme of the United States Department of Agriculture, has recently installed an Animal Climatology Laboratory at the Indian Veterinary Research Institute, Izatnagar. A research programme has been started to determine how well the various breeds of Indian cattle are adapted to climatic conditions found in various parts of the country. Other associated studies are being carried out under practical conditions, both on the plains and in the hills, to determine how climate affects growth, reproduction and milk production. These studies will include both basic physiological research and studies of the effect of climate on housing requirements, nutrition, management and disease control. The result of these studies should be a better understanding of differences in the adaptability of the various breeds and the development of recommendations for the most efficient housing, feeding and management programmes for the various climatic regions.

Research already conducted here in India and elsewhere in the world has shown that poor nutrition and high frequency of diseases and parasites are more frequently the factors responsible for low levels of milk production than is climate alone, although all of these factors are influenced by climate. There is a tendency for cattle, with the inherited ability to produce milk at high levels, to have greater nutritional requirements and greater susceptibility to diseases and parasites than cattle with less productive ability. Thus we are faced with the difficulty of determining what feeds are available

and how effective disease and parasite control measures are needed in a particular climatic region before we can decide what type of cattle will be best adapted and most economical for use. We know, for example: that European breeds of dairy cattle are well adapted to the climatic conditions of the limited quantity of high quality roughage available. In this case, we might find that one of the improved Indian dairy breeds, such as the Red Sindhi or Tharparkar, might prove to be more efficient. Before we can recommend their use, however, we must know what type of housing and management is necessasy to allow them to adapt to the cool climate of the hills.

The development of knowledge of the climatic conditions which exist in the various parts of India, together with knowledge of the nutritive value of feeds produced in the various regions , which is now being assembled by the Regional Nutrition Laboratories supported by the I.C.A.R., will provide the necessary background information for the interpretation of the results of climatological studies. Thus, climatological research is just one branch of the science of Animal Production. It can serve, however, to bring together the findings of the nutritionist, the pathalogist, the parasitologist, and the meteorologist, and assemble them into practical recommendations which will make it possible for the cattle now available to be more effective and thus of higher "quality". In cases where the cattle required for certain climatic regions are either not available, or not available in adequate numbers, the animal breeder will be provided with the necessary information for him to develop, through appropriate breeding programmes, the necessary animals.

In this article an effort has been made to outline the role the science of Animal Climatology can play in improving the "quality" or efficiency of milk production of Indian cattle. It has not been possible to go into technical details of how this research is conducted, but rather some of the objectives of the programme have been outlined. With the establishment of the Climatology Laboratory at I V.R.I. India has the only such laboratory in the Far East and one of the finest in the world. It has also been located at an Institute where research in all fields of Animal Production and Health is being carried on. Thus all of the personnel and facilities or cooperative research to study the interactions of climate and other factors affecting the productivity of cattle are available. The results of the studies conducted here can be of tremendous assistance to the development of better producing cattle in India, as well as many of the other tropical and subtropical countries of the world.

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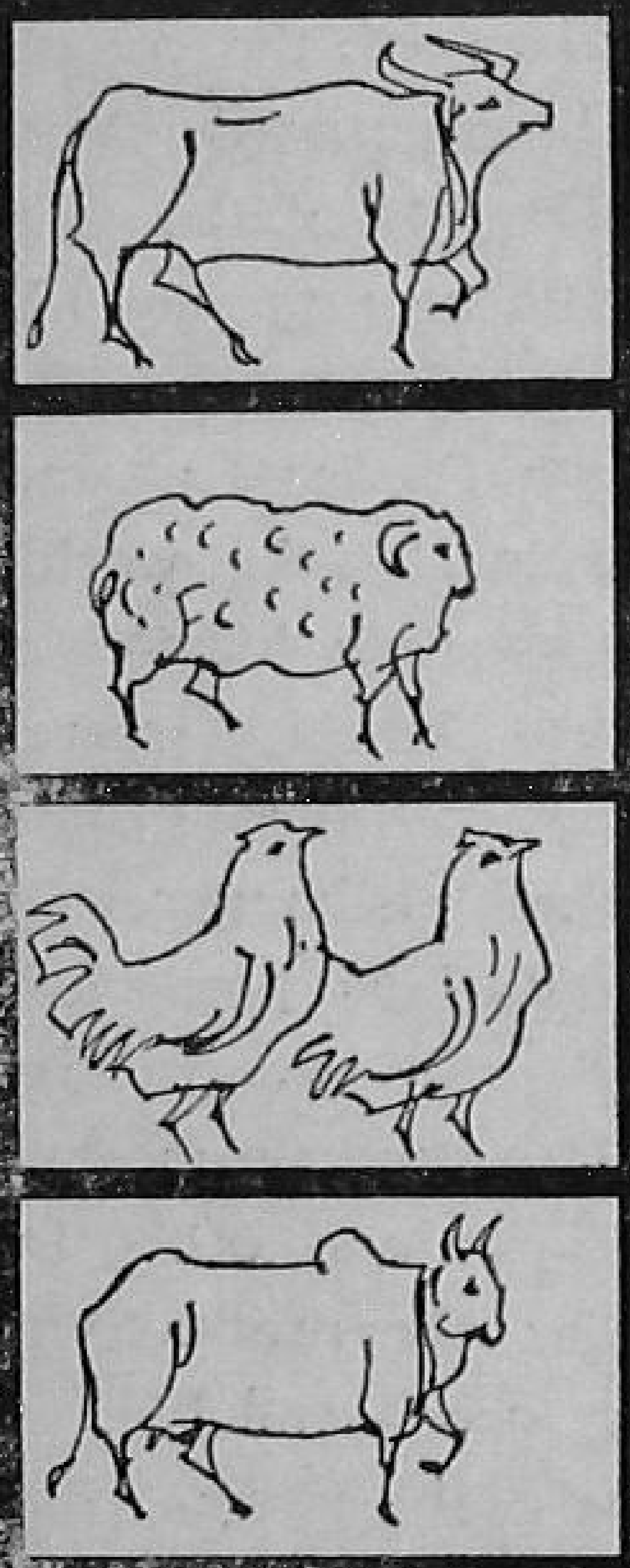

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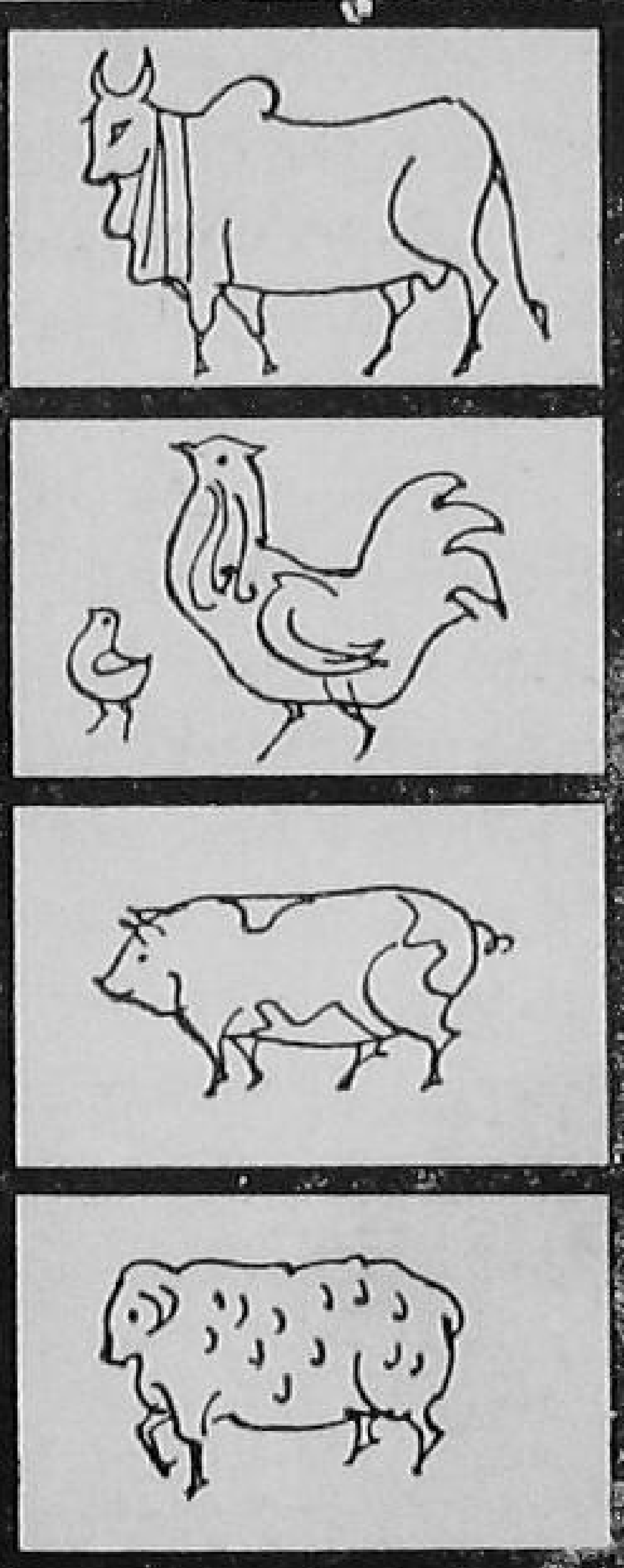

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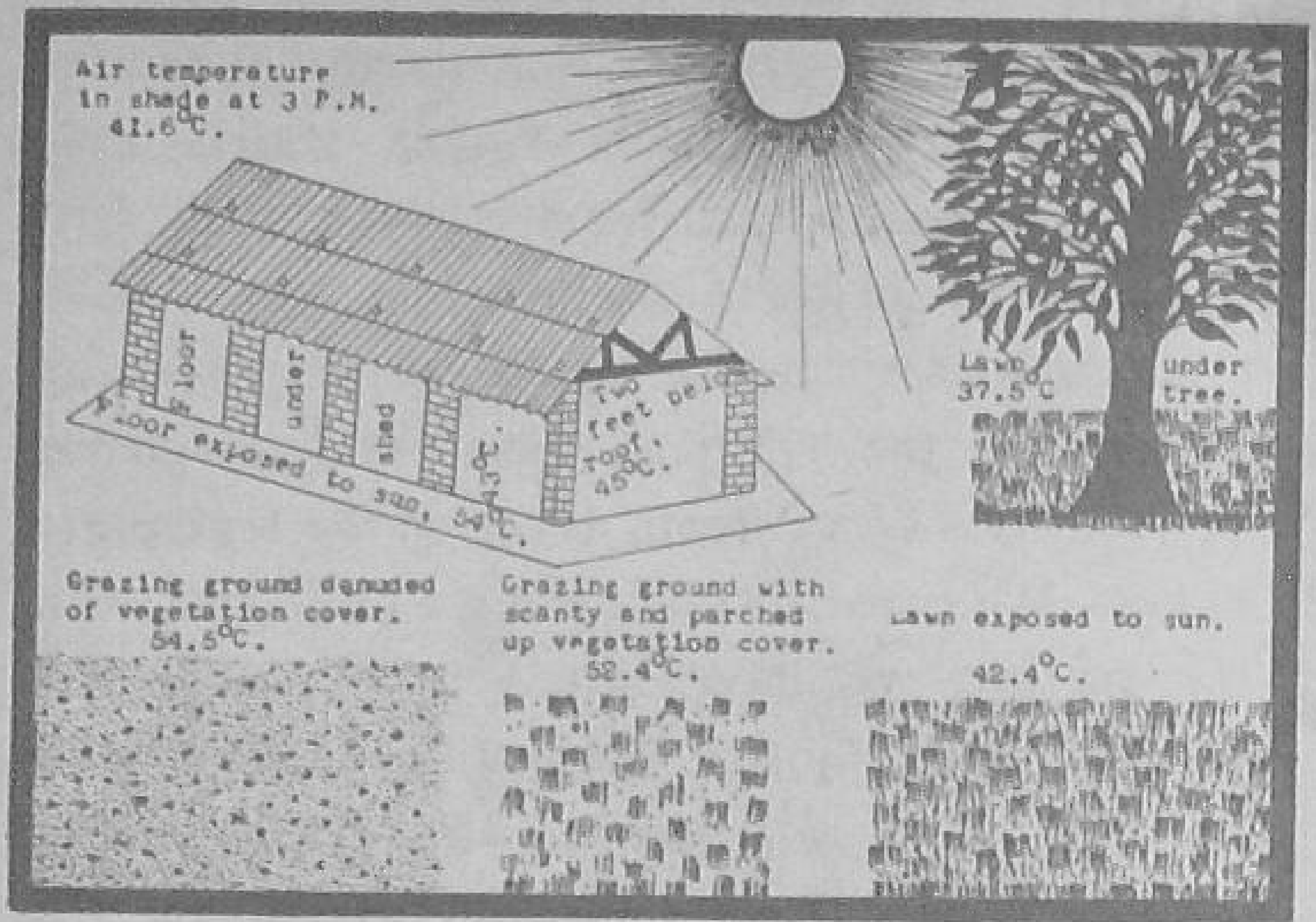


Fig II

Some facts about

ANIMAL PERFORMANCE IN RELATION TO MANAGEMENT

by : Dr. A. Roy

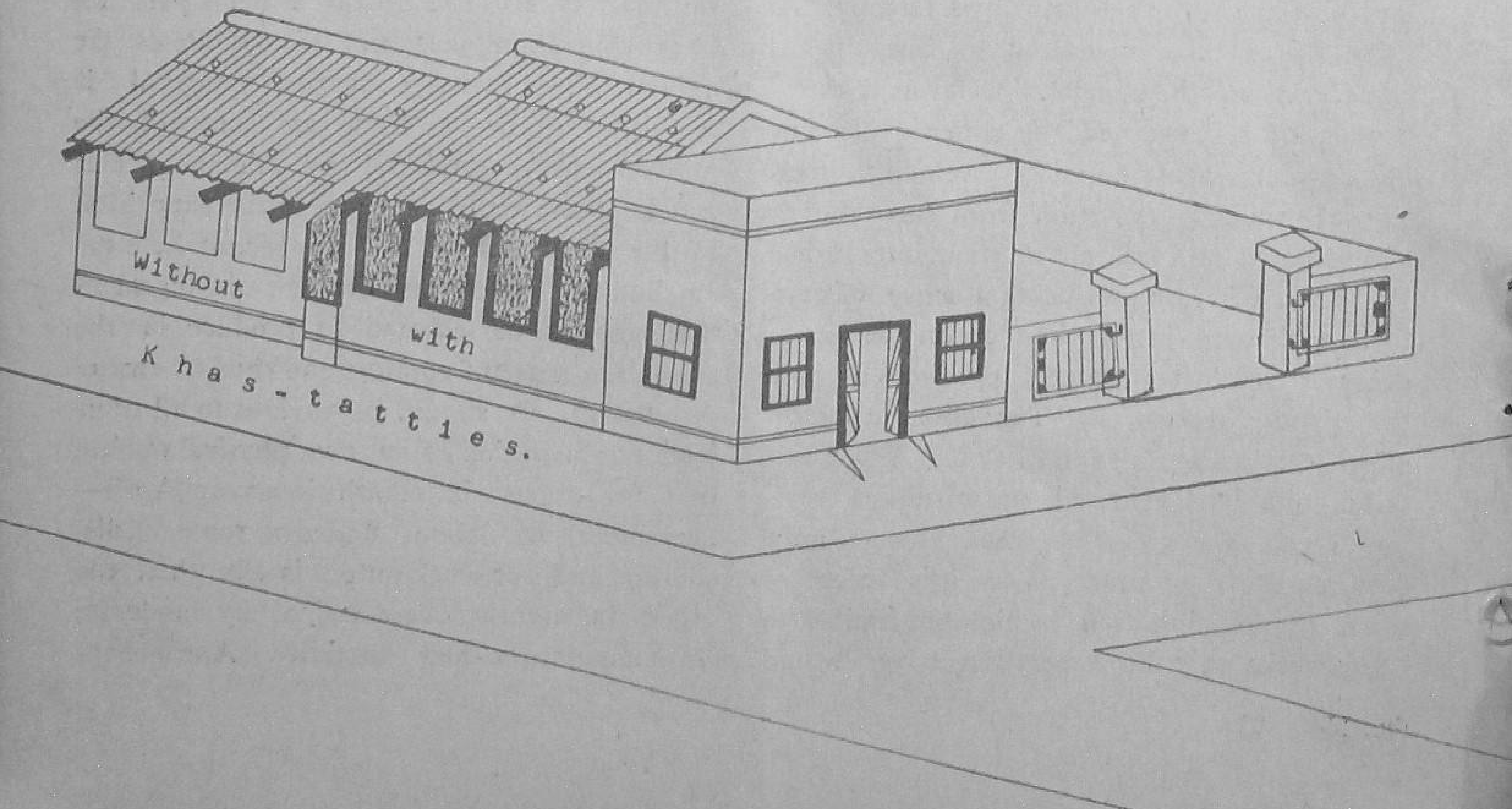
THE usage of the words "Animal Management" includes all those practices which would ensure the comfort the livestock needs to produce maximally. The practices are handling of animals, their housing and feeding. All these factors are orientated to one over all consideration—the climate. As far as livestock production is concerned, the climatic elements like air temperature, humidity, velocity, intensity of sunlight, radiation from surroundings and seasonal rain fall, are of great importance. These can affect by producing a sense of comfort or distress just as these do on the human beings. Comfort promotes production while the distress reduces it. The climatic factors affect production also indirectly. When rain fall is suitably distributed, the resultant vegetation can be enough to meet the nutritional requirement of animals. When it is scarce or when the precipitation is high but limited to a few weeks only the vegetation cover would be poor. If on the top of it, air temperature and wind velocity are high, the green vegetation becomes parched up and the animals are subjected to acute shortage of nutrients. Heavy rain fall is also bad because it helps parasites to grow in abundance and so debilitates the animal that their production potential is severely curtailed. These are some of the indirect effects produced by climate. This article, however, is devoted to the exposition of the direct effects and to record here the ameliorative measures through management that should be effected to produce in the animals, a sense of comfort and thus to ensure production. It should be obvious to all of us from consideration of our own physical welfare that for about six months in a year (April—September) we labour under a sense of discomfort and our work output is less than the other six months characterized by moderate air temperature and humidity. April—Sep-

tember are months of high temperature initially and ultimately high temperature and humidity. We grumble about these months and take such measures which would minimize the discomfort. Curtailment of work load during the day, reluctance or refusal to go out in the sun, closure of the doors and windows to prevent "loo" heating up the rooms, shutting off sunlight by fitting coloured curtains and thereby decreasing its intensity, drinking of cool water, increased number of baths, keeping cool by fan or coolers—such are the measures employed to generate a sense of comfort and help greater work output. The animals are just as good warm blooded animals as we are and they also grumble in a sort of way during these months. They can not grumble vocally or as vocally as we do; their grumbling takes the form of decrease in their producing capacity, their discomfort is evident from the heavy panting. Just as we all feel really comfortabe when the air temperature is around 80°F, for the animals also there are optimum temperature around which they produce maximally. We are conscious of it because we provide shelter to the animals—animals housing is the word for it. Housing pattern in the tropical countries have got to be very different from those in the temperate zone. We recognize it when we build our own houses but we have failed to take note of it while considering the housing of animals, or have noted it in a manner which can not adequately answer the requirements posed by the varying types of tropical climate. (see Fig I)

The one reproduced (Fig I) is typical of the animal houses and is known as half-wall shed; the roof is either galvanized iron or A-C sheets. Based on the data collected in the course of a research project in Mathura, the temperature obtaining in the shed and at various locations around it are shown in the diagram (see Fig II)

Fig I

CONVENTIONAL HALF WALL ANIMAL SHED.



Here in Mathura air temperature of 100°F and above—upto a maximum of 118°F—were frequently encountered for 10-15 hours a day during the height of summer. The distressing effect of such a weather was further aggravated by the stress imposed by direct and reflected solar radiation. In many places in Northern India such an environment characteristic of the summer is encountered for a period of 50-100 days and the animal in the field, during the summer, is not only burdened with the above heat load but the consequent stress of high temperature is further aggravated by the exposure to the sun for over 12 hours a day for foraging in terrains which are sandy and practically devoid of vegetation cover. Is it any wonder that our animals produce much less? Scientific experimentation has further shown that exposure for a longer period to stressful condition produces more and permanent damage than a stress which is acute but of shorter duration.

For livestock production the climatic elements viz. air, temperature, humidity velocity, intensity of sun–light, radiation from surroundings and seasonal rainfall, are of great import. These elements help in producing a sense of comfort to the animal.

Some of the results obtained at Mathura are informative. The climatic data in the conventional animal sheds and outside have been given in the table given at the end of the article.

The characteristics of the sheds were as described below:—

Shed I : was a conventional half wall shed (24′×32½′×14½′) in the farm. The roof was of asbestos and the half wall brick-laid and plastered. The manger was cemented and there was a passage 3½′ wide in between the manger and the half wall. The shed was so oriented that direct sunlight never fall on the animals at any time of the day. The paddock (71′×38′) was bone dry and consisted of 2 to 3″ layers of loose sandy soil.

Shed II : was the same as the above with only the following modifications :

The space between the pillars were closed with khas-tatties and a bucketful of water was sprinkled at 11, 13, 16 and 17 hours.

Shed III : The shed consisted of roof made of 15′ long asbestos sheets fixed at 60 degree inclination. The floor was cemented and 10' in width and 98' long. The shed was devoid of any wall on three sides and the North was closed by the partition wall.

Bulls were put in these sheds on April 15 for 20 days to condition them to the respective environment in the sheds and semen was collected there after on a 5-day interval schedule. Semen could be collected on every occasion from bulls maintained in sheds I and II. The bulls in shed III, in the beginning of the experiment, mounted the teaser cow only once; the semen obtained was very very poor. The loss of libido and semen quality can be easily attributed to the climatic conditions under which they were maintained. The quality of semen from bulls in shed I was better than shed II but irrespective of shed the semen quality obtained during summer was vastly inferior to the semen obtained during all other seasons excepting perhaps the height of autumn. Studies elsewhere have shown that the deterioration due to heat stress of semen is not limited to summer only but is carried over for quite

sometime to the subsequent seasons. In view of the widespread use of artificial insemination the implication of these results are quite clear. Such semen samples during storage deteriorate within a few hours and if used after a day the resulting fertility is poor. Moreover the deterioration in the fertility would be carried over to seasons which favour production of good quality semen with better fertilizing capacity.

In another investigation under the same project the milk production was compared in animals maintained under the conventional half wall shed referred to above and a specially constructed shed. The climatic conditions in the two sheds were as given in Table II reproduced at the end of the article.

It was found that the moderate protection from excesses of heat stress offered in the specially constructed shed helped the animals to produce 30% more milk. In yet another experiment it was found that buffalo cows did not come in "heat" when maintained in the half wall shed but all those maintained in the other came in heat. This is just an illustration to show what heat stress can do but has relevance to the calving rate of cows, settled at the height of summer. It has been found that decline in fertility in cows assessed on 30 and 60-day non-return basis is more in cows settled during the hot season as a result of mortality of the embryos because of heat stress.

Means directed towards minimization of the heat load should, therefore, receive top priority to ensure optimal production. The first that comes to mind is shelter for the animals. The designing of animal houses should create conditions inside it to promote production and need be based on principles of ventilation aimed at keeping the animal in as physiological condition as possible. Measures provided they can be justified on economic principles, should be taken to decrease the heat load on animals in the tropical countries. The importance of the shelter is best illustrated by the results obtained by a group of workers in California from investigations carried over a few years. They used the gain in weight as the index. For six months of the year temperature remains above 75°F, exceeds 85°F for four months and is in the region of 90°F for two months. Eleven different types of sheds were considered and the table III at the end of the article shows the weight gain as well as the climatic condition.

Using animal preference as another index, it was found that the animals preferred the third shed most; the galvanized iron shed was never used. The material used in the construction of the animal house need to be considered more intelligently. In our country, since temperature during summer goes up very high and is followed by acute precipitation, a combina-

Management is a combination of many practices. Each of them in isolation cannot show any spectacular result, but some of them would, claims the writer.

tion of different materials would be necessary to construct animal sheds. Materials to be used should be such or treated in such a way that the outer surfaces possess the property of absorbing minimum and radiating maximum heat. The reverse should be true for the inner surface. The houses should be oriented east and west and the areas immediately surrounding the houses should have a vegetation cover to minimise radiation reflected from the surface. Bare soil particularly sandy soil is ideal material for reflecting heat. Animal houses for accommodating a few animals only could with very great advantage be constructed under a tree; tall trees should be planted on the east and west of those housing large number of animals. There are reasons to believe that shed temperature per se. is not as aggravating a condition when it acts alone as when other factors like intense sunlight, hot wind and radiation from surroundings are added to it. It has been shown by the California group of workers that provision of temporary thatched sheds open on all sides in the grazing ground gives considerable relief to the animals. In our country, this may not be possible but the tree planting movement should be intensified and actively pursued by all those interested in animal welfare.

Where the weather is hot and humid, increasing wind velocity has been shown to help production measured in terms of rowth, as shown in the table IV.

Similar effects have also been found when cooled drinking water was used during summer (see Table V.)

It should also be realized that with cattle, one needs to consider not only the external heat load with which the animals are burdened during summer but also the internal. These animals harbour a furnace in their body which generates considerable heat—namely, the rumen as a result of the fermentation by the microbes. Advantage has been taken of this furnace in the western countries to keep the animals warm by supplying the proper fuel during the colder months. Coarse fibrous fodder help to produce more heat while green fodder reduces it. The feeding practice during the summer in our country is quite clearly unscientific and adds to the heat load. It is at this time of the year the basic ration of animals is straw (Bhoosa), or materials high in fibre content. Moreover, as far as possible the furnace should be loaded with the minimum amount of fuel of every nature during the day to cut down the fermentation heat. Cooler periods, that is early morning and night, are the best time to enable the cattle to eat maximally and make the best use of it. For the same very reason animals should be, wherever possible, allowed grazing only during night hours because the very act of grazing is increased muscular activity which helps to generate heat. All heat producing activities should be reserved for the cooler night hours and prevented during the day when animals ordinarily are under stress due to exposure to either or both solar radiation and high temperature of the day.

Management is a combination of many practices. It may not be possible to bring in all the practices into managerial operation because it may not be economically justifiable. Each of them in isolation cannot show any spectacular result but some of them would. "The philosophy that every 'little bit helps' should be applied to the problems of favourably modifying effects of climatic stress vis-a-vis efficient livestock production."

TABLE I

Average climatic data during summer.

	Air Temperature (°F)		Relative humidity (%)		Wind velocity (ft/min)		Max. temp. (°F)	min. temp. (°F).
	Morning	Evening	Morning	Evening	Morning	Evening		
Shed I.	82.9	102.3	48.2	22.8	21.5	98.2	106.5	77.9
Shed II.	91.4	100.8	48.0	45.0	N.R.	N.R.	105.8	87.8
Shed III.	82.4	108.5	42.0	20.0	162.0	550.0	109.4	82.0
Outside environment	83.0	107.1	42.0	19.0	248.0	552.0	110.3	82.4

N.R.=Not recordable

TABLE II

Values of climatic elements in the experimental shed and farm house.

Location.	Air temperature (°C).		Relative humidity (%)		Wind velocity (ft/mt)		Max. temp. (°F)	Min. temp. (°F).	Radiation exchange (evening 4 P.M.)K.cal sq. m/hr.
	Morning 7 A.M.	Evening 4 P.M.	Morning 7 A.M.	Evening 4 P.M.	Morning 7 A.M.	Evening 4 P.M.			
Experimental shed.	86.7±0.9	90.8±0.9	61.5±3.7	52.1±3.4	*	*	91.3±0.9	87.2±0.8	*
Farm House	87.5±1.1	101.0±0.4	46.0±3.4	29.7±3.4	22.0±8.1	127.0±38.7	108.1±1.2	86.0±1.6	58.0±7.4

* Not high enough to be recordable by the instruments used.

TABLE III

	Galvanized iron shed.	Aluminium and Burlup roof.	Hay and galvanized iron roof.
Air temperature outside.	103.5	103.5	103.5
Air temperature under shed.	104.0	101.5	101.5
Temperature of under-side of roof.	127.5	89.0	92.0
Temperature of ground in shadow.	107.5	97.2	100.0
July weight (lb).	430	429	420
September weight (lb).	467	472	468
Daily gain (lb).	0.69	0.80	0.89

TABLE IV

	Experimental	Control
Initial weight	669	669
Final weight	831	759
Daily gain	2.32	1·29
Dairy feed	21.41	17.18
Feed/100 lb. gain	924	1330

TABLE V

	Warm water	Cooled water
Initial weight	768	761
Final weight	823	835
Daily gain	0.78	1.04
Daily feed	19.36	20.35
Feed/100 lb. gain	2481	1958

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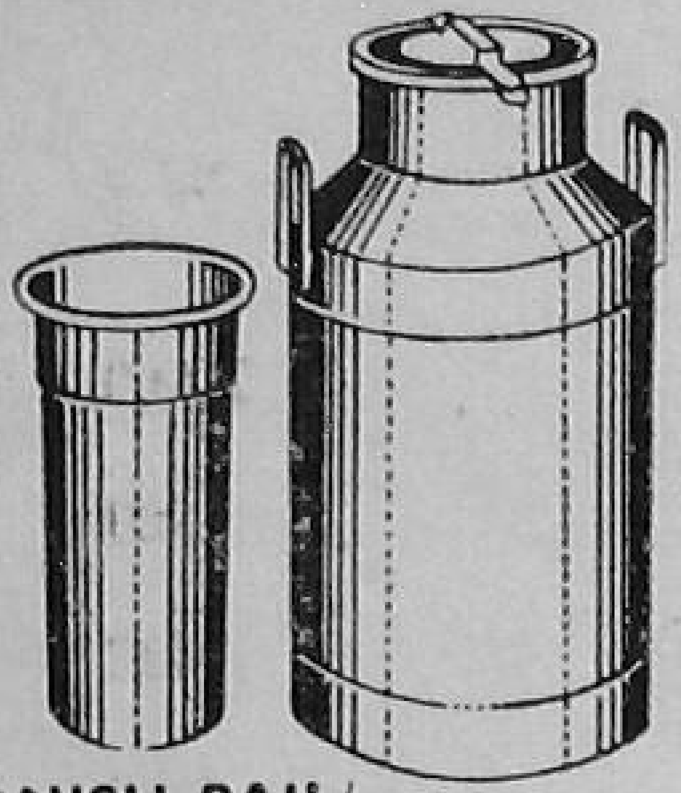

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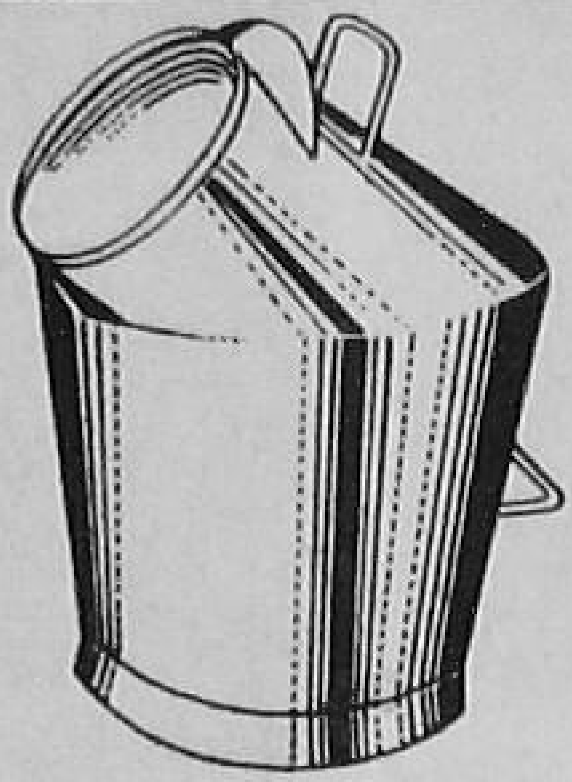

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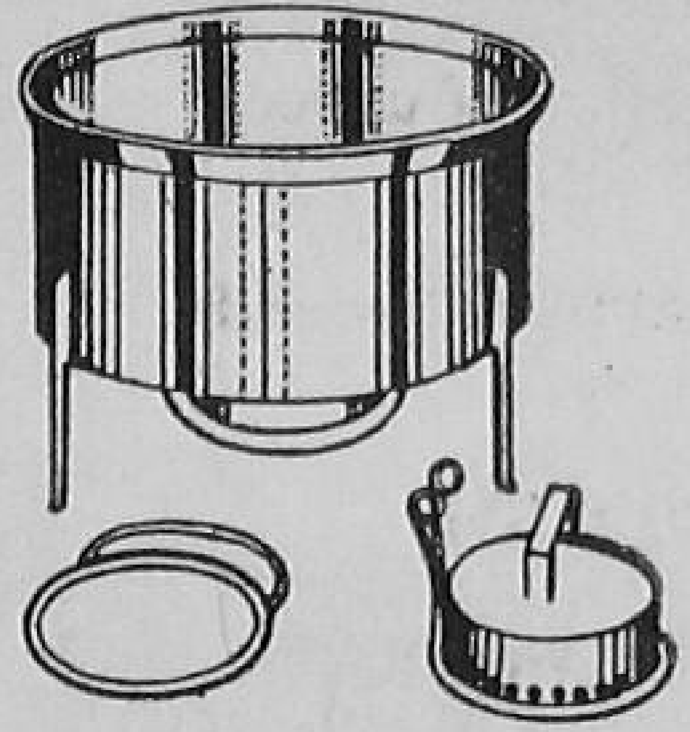

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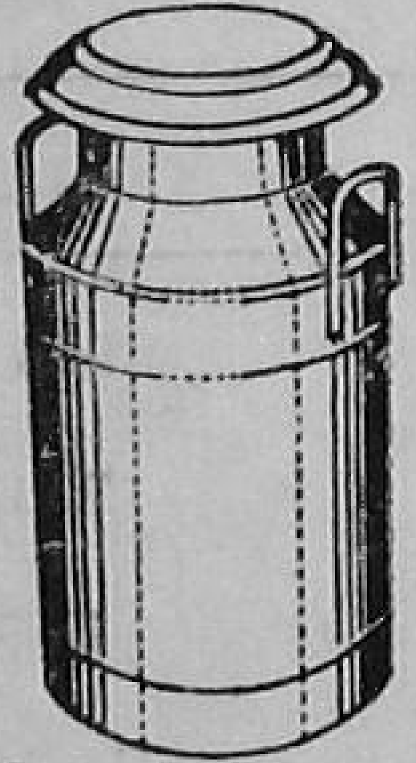
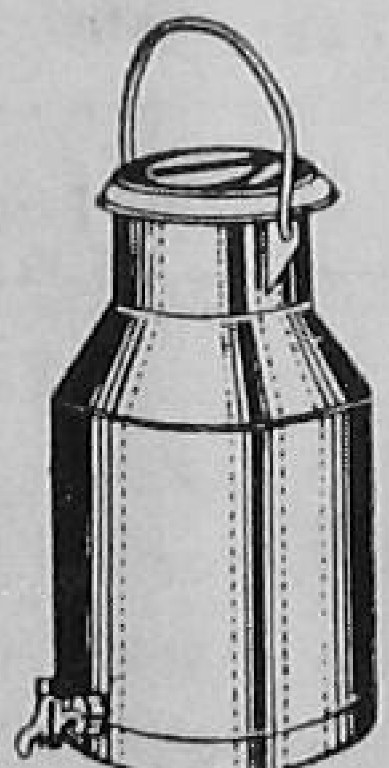
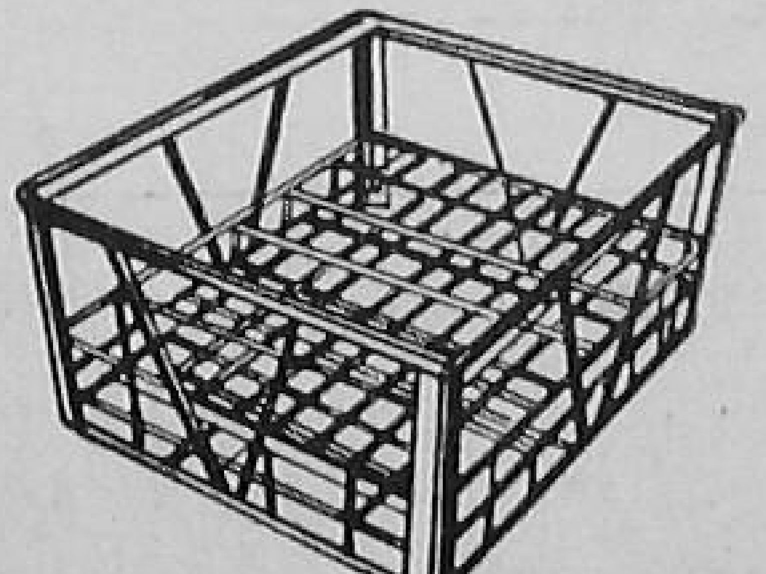


DANISH
TRANSPORT TYPE CANS



DANISH
DELIVERY TYPE CAN



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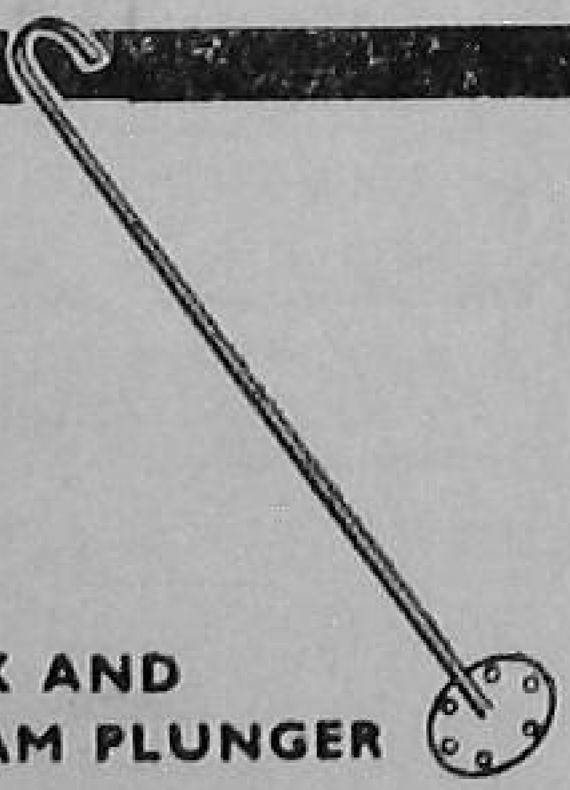

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by : SHRI S. JAYARAMAN

Standardisation And Quality Control

In the Marketing of Livestock and Livestock Products

WITH a bovine population of nearly million head and sheep and goats numbering over 40 and 60 millions respectively India is rich in her livestock resources. Livestock and livestock products play a vital role both in the country's internal as well as export trades contributing considerable foreign exchange to the country's coffers. Improving the quality of livestock and livestock products is, therefore, of paramount importance more so in the present context of export promotion. Recognising the vital importance of livestock in the development of national economy, the Planning Commission has rightly emphasised the need for effecting various improvements which would not only provide better cattle but also increase the production of livestock products. Any plan for increasing the production of goods without simultaneously effecting improvements in the marketing of the same is likely to go away. The evergrowing population of the cities and towns coupled with the inadequacy of space for the human population and the location of new industries that are coming up makes it imperative for the livestock to be shifted from the cities to farther areas, which, in turn, calls for an efficient and elaborate system of marketing for making available the goods to the consumers at a price which they can afford and at the same time, which could be remunerative to the producers so as to provide them with the necessary incentive not only to stick to the profession but to build it up and produce more.

With the rapidly growing urbanisation the distances between the consuming centres and the producing areas are on the increase. This factor together with the urge for exploring new and distant overseas markets have been responsible for the development of a complex and sound system of marketing unlike in the olden days when the barter system was in vogue with the buyer and seller close to each other. Marketing which is getting the product to the consumer includes all of the processes involved in the transfer of goods and title from the producer to the consumer. The goods produced and sold by farmers have to be collected, stored, transported, processed, prepared for the market and delivered to the consumers in the form and at the time and to the places that they desire.

Standardisation and grading of products by recognised standards of quality constitutes one of the essential links in the long chain of marketing. Grading is a primary prerequisite of orderly marketing and is chiefly meant to differentiate amongst the various

qualities of a product so as to provide a yardstick to measure the relative differences among them and thus provide a common trade language which will be understood both by the sellers and the buyers in distant places on the basis of which business could be transacted on a dependable basis without taking recourse to physical inspection of goods. Absence of uniform quality standards has always resulted in waste. The export of ungraded and unmarked agricultural commodities and livestock products has brought a bad name to the country reducing thereby the Nation's earnings in foreign exchange.

In India the need for effecting sales on the basis of grade standards was first emphasised in the year 1928 by the Royal Commission on Agriculture. The importance of grading has been emphasised in all the National Five Year Plans. The first landmark in the history of agricultural marketing in India was made in 1937 when the Agricultural Produce (Grading and Marking) Act, 1937 was passed. The Act authorised the Government of India to prescribe grade standards for various agricultural, livestock and horticultural commodities and promote grading of these. Under this Act, grade standards have been framed in respect of several commodities which include many livestock products also. As a matter of fact ghee was the first commodity to be graded in the country under that Act ever since 1938. Presently the livestock products covered by the Act are ghee, creamery butter, eggs, hides, skins, wool, bristles and goat hair. While grading in respect of the first five are voluntary and is for the internal trade, grading in respect of wool, bristles and goat hair is for export trade and is compulsory under Section 19 of the Sea Customs Act, 1878.

Grade standards are based both on physical characteristics as well as on internal attributes. The specifications are actually worked after analysing a large number of representative samples of each commodity collected from different centres of production and consumption representing different environmental conditions and agricultural practices. Standards are so framed as to ensure purity as well as quality of the products. Grade specifications are subject to periodical revisions so that they may reflect the shifts in the pattern of production and consumer-preference. In order to ensure that a product offered for grading conforms to the prescribed grade standards, the product is inspected and analysed according to well-defined procedures and methods of analysis.

How is grading useful ? While on the one hand, grading, by ensuring purity and quality, permits the buyer to purchase more precisely what he wants and is willing to pay for, on the other, by providing consumer satisfaction, it helps to bring better returns to the producer. In other words, if the seller can offer only an average or unknown quality, the user of premium products may be unwilling to pay for the inferior part of the consignment which he does not need and the user of low quality goods cannot afford to pay proportionately for that part of the consignment which is of premium quality. As long as there is variation in the purchasing power of the consumers and as long as the consumer preference varies widely for different articles of food depending largely on their food habits there is bound to be a demand for all the grades. The highest quality product, if sorted out and sold separately, will bring premium price from those able and willing to pay it, and the low quality products will find a market among consumers with lower purchasing power or less exacting

tastes, who otherwise might be induced to buy only if the price on the goods is reduced to a level which they could afford.

Grading also does away with personal inspection of goods by the seller. This assumes greater significance in view of the distance between the producing end and the consuming market which is growing day by day with the expansion of trade. The quality of products being well defined the buyer is in a position to place orders by mail, telephone etc., and can buy with implicit confidence. This incidentally reduces costs of marketing since it eliminates the buyer undertaking a trip to the producing centre. For example, Indian bristle, an expensive livestock product of international importance, was mostly sold in London by auction after visual inspection of the consignments by the prospective buyers although the buyers were mainly drawn from countries other than the United Kingdom. Ever since the introduction of grading under Agmark in 1954 there has been a steady increase in direct sales on firm order basis by-passing the auction as the quality of the product is both well defined and assured.

As it is easy to evaluate graded produce in terms of market prices, grading facilitates the settlement of claims. To illustrate this point the export of wool consignments can be cited. Other quality factors being equal, wool consignments are evaluated on the basis of clean wool content. The settlement of claims arising as a result of disputes is rendered easier with the advent of Agmark grading.

Grading also enables the pooling or intermingling of products for further shipment. This factor is of great utility in the development of cooperative marketing. The need for maintaining the identity of the produce of each farmer is totally eliminated. Financing of the marketing of products becomes easier with graded produce since it is possible to secure a more accurate estimate of the value of the produce. Grading thus bestows several benefits on all sections of trade.

Although voluntary grading under Agmark in respect of various livestock products has been carried out for several years and has made considerable progress, much still remains to be done in this field. More commodities still remain to be brought within the orbit of grading under Agmark. In order to increase sales of graded produce it has to be brought home to the average Indian consumer that graded produce is certainly superior to its ungraded counterpart from any angle though the graded product may be a little dearer on account of the additional cost involved in grading. Consumer education assumes greater significance in view of the fact that in the minds of the average consumers a little price difference, however negligible it might be, outweighs considerations for quality.

However, in the field of compulsory grading of bristles, wool and goat hair excellent results have been achieved in a comparatively shorter time. There has been a perceptible and steady improvement in the quality of exports. As the quality is now assured under "Agmark" overseas buyers entertain no doubts on that score. As a consequence, the Indian exporter now gets almost the full payment for his consignment against the bill of lading and the Certificate of Agmark Grading without having to wait for payment till the arrival of his goods at the buyer's end for his visual inspection. The exporters who previously used to send their goods on consignment basis for being auctioned in London or Liverpool are now

getting firm orders which has resulted in a considerable saving in charges on storage, transport and handling in London or Liverpool. Besides, they are also not required to lock up their capital for a considerable time. The exporter is also not exposed to the risk of great fluctuations in prices. His bargaining power is also greatly increased as he is not to depend upon the periodical auctions. When most of the sales were through the auctions there were very limited direct sales to the buying countries like the U.S.A., U.S.S.R. etc. Now with the advent of grading there is an enormous increase in direct sales which has resulted not only in an increase in foreign exchange earnings but has also brought about an increase in dollar earnings.

It is clear that standardisation and grading of livestock and livestock products will greatly help the producers in bringing greater returns and thus provide them with the much needed incentive to produce more and better quality livestock and livestock products. In the field of export trade in particular standardisation bestows great advantages of far reaching importance.

While standardisation has made great and rapid strides in the field of industry, in the field of agriculture and animal husbandry it has not kept pace with the progress made in industry. There are several handicaps in the case of livestock products. Most of them are highly perishable and bulky. These factors stand in the way of long distance transport. The production is also scattered in small lots over widely distributed areas. The average producer is ignorant of modern methods. Being illiterate, he is also averse to taking to improved methods. In order, therefore, to enlarge the field of standardisation and grading in the marketing of livestock and livestock products inspection services should be organised in all the States in respect of livestock and livestock products. Any scheme for the improvement of livestock, therefore should also include programmes for standardisation and grading preferably at the producer's end itself as an adjunct to orderly marketing.

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EVOLVING QUALITY ANIMALS

THROUGH BETTER BREEDING

by

Shri K.K. Shukla

It is an accepted fact that Agriculture is the fundamental basis of our rural economy and cattle is the back bone of Agriculture. Agriculture and Animal Husbandry are inter dependent and livestock keeping provides supplimentary occupation to the agriculturists. Thus keeping of livestock as mixed farming practices plays an important role in the rural economy. In spite of having such a large bovine population in the country, the production and supply of milk and milk-products is not satisfactory. The average consumption of milk and milk-products per head per day in our country comes to about 5 ozs. as compared to 60 ozs. in New Zealand, 56 ozs. in Canada, 54 ozs. in U.S.A., 44 ozs. in Australia and 40 ozs. in Denmark. This is because the milk-producing capacity of the cow in our country is very low. The annual average milk production per cow in our country is estimated to be 413 lbs. as against 5660 lbs. in New Zealand, 5220 lbs. in Denmark, 4802 lbs. in Australia, 4400 lbs. in Canada and 3248 lbs. in the U.S.A. Thus it will be seen that the production of cows in those countries is ten times more than what is in India. The facts regarding the cattle population in our country as compared to the above countries is very interesting. The bovine population in our country is 44 for every 100 human souls which is 58 in U.S.A., 79 in Denmark, 90 in Canada and 199 in Australia and 268 in New Zealand for every 100 human souls. Thus it will be seen that the population of cattle in our country is not high, but the fact is that most of the cattle are very poor in their capacity for milk production.

In view of these facts, what is required is better quality animals so as to make them more economical. The population of high yielding animals should be increased replacing the poor stock so that the milk-production and the per capita consumption of milk and milk products can be raised to a considerable extent.

The immediate production, no doubt, can be increased by

better feeding, care, management and disease control. This is because the present level of animal nutrition is very low ; and cattle are neglected in certain parts of the country.

It is an established fact that the cow must have inherent capacity to produce milk; and this quality can be exhibited according to the care, management and feeding of the animal. It is, therefore, very essential that such qualities should be introduced in our local stock by breeding with better quality bulls. There is a saying that "Bull is half the herd", because the inheritable characters are transmitted by the bull in its progeny which is 50% from the sire and 50% from the dam. So also it is possible to get about 400 to 500 young ones from one bull during its life time which is a great contribution towards the cattle improvement work. Similarly if by chance a bad bull is used, it may hamper the progress and deteriorate the local stock. In view of this the selection of a bull for breeding purposes is most important. It should be of the recognised breed of the area. The bull should be of known good percentage and should posses all the characteristic points of the breed. It should have all the good points of confirmation as a breeding bull. It should be free from disease and good in health for breeding purposes. A progeny tested good bull is the bull which should be used but it is very difficult to get such bulls. In view of this we have to select bulls from dams and sires having good performance.

There are very few breeds which are pure and recognised breeds in our country. In most parts of the country, we find mixed and non-descript cattle. The programme of cattle improvement carried out at present is selective breeding in the tracts where there are pure recognised bulls of cattle. High producing animals are bred and reared on Government Cattle Breeding Farms and such other institutions. The bulls produced on these breeding centres are issued in key village blocks, Gaushalas and villages for improving the local stock. Thus the local inferior stock is graded up by better quality bulls. This method of breeding has helped in the maintenance of pure breeds in our country. The important breeds are Shahiwal, Sindhi, Tharpaker, Hariana, Gir, Kankrej, Ongol, Khillar, Amrit Mahal, Kangyam etc. It will be seen that we have only a few breeds which can be called milch breeds. The times and conditions are changing. Some of the agricultural operations are being carried out by mechanical means such as lifting of water for irrigation, transport of farm produce and such other allied activities. On the other hand cities are developing and industrial townships are coming up where the demand for milk is increasing. We can meet with this demand only if we increase the milk producing capacity of our cattle. We have to make them profitable from the commercial point of view. To keep a cow only for producing bullocks will not pay. She should also produce sufficient milk to make it profitable. Thus the question arises as to how to introduce milk producing qualities in the draught breeds or non-descript cattle in our country. Selective breeding will be a very slow process in this case and hence cross breeding is the only method to introduce milk. The bull to be used for breeding purposes should be from any milch breed. It may be of any good indigeneous breed or from exotic breeds. Very encouraging and promising results have been achieved at the Government Cattle Breeding Farms and such other institutions in the development of different breeds. Even the dual pur-

pose breeds, like Kankrej and Hariana cows have yielded upto 45 lbs. of milk in 24 hours in the peak of the lactation and the milk yield in a lactation of 300 days have gone above 10000 lbs. in the important breeds of milch and dual purpose breeds of cattle. The most important points to be kept in view for the development of any breed of cattle are high milk producing capacity combined with draught required for agricultural operations, early maturity, regularity in calving with good body confirmation to the breed. The breeding programme is taken up at the breeding stations keeping in view the above points. The bulls raised from such herds are issued at Artificial Insemination Centres, Key Village Blocks, other subsidised breeding centres and to the cattle breeders. Bulls from such recognised milch breeds or general utility breeds can be used for up grading the local stock as well as for cross breeding with the draught breeds for introduction of milk quality.

It has been found that it is possible to increase milk yielding capacity in the first generation by cross breeding with exotic breeds.

Looking to the past experience and the breeding works that have been carried out in our country it is desirable to use bulls from any indigeneous milch breeds for cross breeding purposes. The breed to be selected for cross breeding the local cattle should be decided keeping in view the requirements of the villages in the areas where this work is proposed to be taken up. It should also be decided as to what extent this programme of cross breeding is to be continued so that the bullock power required in the tract is not lost. The breeding policy in such areas should be clearly laid down so that a new type is evolved which is a general utility animal for the area.

The cross breeding with exotic breeds should be restricted only to the areas which are suitable for this purpose otherwise it is likely that we might loose what we have got as draught power without any gain in milk producing capacity.

In the breeding programme, it is very important that only better quality bulls are used and inferior ones are castrated. Even more important is the organisation for the proper location of bulls, their full use for breeding purposes, their care, management and proper feeding arrangements under village conditions. Gram Panchayats are the proper organisations which can take up this work. There should be one "Nandi Shala" in each village for proper housing of the bull and the village panchayat should arrange for proper feeding care and management of such breeding bulls. They should provide sufficient funds in their budget for this purpose. Only such certified bulls should be used to produce quality animals and surplus inferior bulls should be castrated to stop further deterioration of our cattle. The artificial insemination method of breeding is also one of the ways to get quicker results of cattle improvement. High grade quality bulls are limited and as such the multiplication of such good germ-plasm can be achieved by this method, which should be carried out cautiously and in most scientific manner.

The better quality animals will supply good bullocks for our agricultural operations and at the same time supply more milk and milk products for the country for the well being of the people.

QUALITY ANIMALS *through* BETTER BREEDING

THE subject has been dealt with special reference to conditions in India. More attention has been paid in the article in bringing out the problems connected with the breeding of dairy animals. Mostly the practical aspects have been dealt with.

A calf derives the qualities of milk production or capacity for work from parents. In the case of the female calf, these qualities become apparent when she is mated on attaining breedable age and actually starts yielding milk after calving. In the case of the male calf, the qualities inherited by it become apparent if it is given a chance to breed later on and when its daughters start yielding milk. The position is reversed when it comes to draught qualities. Here the male shows the qualities of draught ability inherited from parents and the female merely acts as the producer of future generations of male calves.

No two calves, though from the same parents, receive identical sets of genes because of the chance factors involved in the assortment of genes taking place at the time of the production of gametes by each parent. Therefore, there is always a certain amount of variation in the performance of these calves. The variations in performance are more marked when progeny of different parents are involved. This is the reason why in the same breed we always find individuals whose performances vary a great deal. For example, it is quite

By

Dr. K.S. Shetty

common in the Sindhi, Murrah or other Indian dairy breeds that we know of, to come across many cows which yield less than the breed average per lactation, while quite a few individuals have records of over 5,000 to 6,000 lb. of milk. It is the variability in the performance of animals that enables breeders to select individuals from which to breed for the improvement of the herd. If there had been no variability, it is obvious that selection for improvement would have been impossible and there would likely have been stagnation at a particular level. Variabilities in performance or differences between animals in levels of production are therefore powerful weapons in the hands of a practical breeder of dairy animals for improving the breed. The opposite is also true; i.e., if variability in the performance of animals in a herd is ignored and animals for breeding are merely selected for what they look like, the chances are that the average level of production in the herd will come down.

Normally, one would expect that genes inherited by an animal from its parents constitute the only factors in producing these differences between animals in levels of production. But, in practice it is found that the effects of genes are modified considerably by environment. By environment is meant the climate, management, feeding, calving in the proper season when plenty of green feed is available and such other conditions under which animals under observation have to live and produce. The fact that differences in environment have great influences in bringing about variations in the performance of animals, however closely related in respect of their genetical make up, has been proved by means of carefully conducted studies in monozygotic cattle twins (identical twins). Identical twins are those twins formed from one and the same fertilised ovum. Each individual out of a pair of such twins will for this reason have an identical set of genes. Theoritically speaking, each of a pair of identical twins should therefore perform in exactly the same manner under any conditions of environment, if variations in performance were due only to the effect of genes. But in fact, it is found by experiments conducted with sets of indentical twins that one of each pair will perform at different levels, when subjected to different environmental conditions. This shows conclusively that environment has as much to do or in fact more than the genes, in bringing about differences in the levels of performance between cows. It can be seen that only variations in the performance of animals due to the differences in their genetic constitution are capable of being transferred to the offspring as those caused by environmental effect are obviously not transferred. Estimates made of the proportions of the differences in the performance between cows or between individuals and the herd or the breed average, caused by differences between their inherited genetic make up, are called "heritability estimates".

A bull can sire a number of heifer calves during his earlier life time as compared to 2 or 3 from the average cow. The bull is more important than any cow in determining the quality of future generations.

Carefully conducted experiments in different countries have placed the estimates of heritability of milk production between 20—40% (i.e., 0.2 to 0.4). Ashfaq & Masson [1] working on Pakistani buffaloes have calculated the heritability of milk production as 0.18 ± 0.16 in one case and 0.25 ± 0.20 in another. Mahadevan [2] working on crossbred cattle in India,

derived a heritability figure for milk production as 0.19 and for Sindhis in Ceylon [3] as 0.2. Stonaker [4] has given the heritability figure for butter fat production of the Sindhi herd at Allahabad as 0.25. It seems probable that heritability estimates for milk production for the Indian village cattle cannot be higher than the known estimates for Sindhi and crossbreds.

Thus, when cows in a herd are mated to the same bull, average of only 10 to 12 per cent of the difference in production levels between dams is transmitted to their daughters. For example, if a Sindhi cow exceeds the herd average with say 1,000 lb. of milk yield in a lactation, she would be capable of transmitting only about 100 lb. of that difference to her daughters. But then, if the bull is not proved to be a good transmitter of dairy qualities, he may actually lower the production, bringing that of daughters sired by him to almost the herd average or even below that. Improvement by selection of the individuals from which to breed on the basis of the records of the dams alone, when heritability of the character looked for is low, is therefore rather slow. This is a common experience in all Government Dairy Farms in India.

As high producing cows in a herd are few it becomes virtually impossible to breed from only the progeny of dams producing above the average of the herd as such calves are few. The main object of many Government farms in India is to increase the herd strength so that as many bulls of the breeds like Sindhi and Sahiwal etc., may be produced for grading village cattle. Obviously, the two things, viz., increasing cow numbers and making more rapid gains in the genetic make up of the herd by selecting from high producing dams alone, are contradictory as rigorous culling cannot be applied under the circumstances.

It has now been realised that, the pedigree of a bull or in other words an account of his ancestry is not wholly dependable as an indication of his breeding worth, unless it is proved that heifer calves sired by him have performed consistantly better than the average cow in the herd under average conditions of environment. Performance of a bull's daughters under average environmental conditions is a fairly reliable indication of his breeding worth. The results of such studies called Sire Surveys or Progeny Testing, are expressed in various statistical devices such as indexing or rating of sires. It is beyond the scope of this article to go into details of the steps involved in proving the dairy merit of bulls by means of progeny testing.

It has to be stated here that, for the results of progeny testing to be reliable, the performance of as many heifers sired by the bull as possible should be observed and

Normally, one would expect that genes inherited by an animal from its parents constitute the only factor in producing differences between animals in levels of production. But in practice it is found that the effects of genes are modified considerably by environments viz climate, management, feeding, calving in the proper season etc.

that the environmental conditions under which these heifers perform should be average. If these requirements are not satisfied, the results of the test will not be free from bias and therefore will not be reliable. These requirements do not usually exist in Government Farms in India which are the only places, if any, where progeny testing of some sort can be carried out. The reason for this is that the usual tendency on such farms is to rely only on one or two prize dairy sires selected for their pedigree as well as appearance. The result is, young bulls in such herds rarely ever get a chance of siring over half a dozen heifers or even less by the time they are ready for issue. Herd size is also small and added to this is the fact that, environmental conditions in Government Farms is artificial due to high levels of concentrate feeding. Hence young bulls tested under such biased conditions may get over rated. They may not actually sire high yielding daughters as expected when distributed to villages where the environmental conditions under which their daughters have to perform are not so favourable as in Government Farms. We have no definite evidence in this regard in India as shown by experiments conducted under controlled conditions. But experience in other countries would indicate the truth in the above assumption.

If superiority of a Dairy Sire is established by properly conducted progeny testing, he can be used extensively for lifting the averages of as many herds as possible by means of artificial insemination. Once the quality of the selected sire is assured, selection of dams to breed from does not present any great difficulty. It only becomes necessary to eliminate those which are intractable, difficult milkers, irregular breeders, poor yielders or those which develop any deformities.

Results of progeny testing are very important aids in the selection of Dairy Sires. In the absence of progeny testing, we have to depend on other aids to selection. These are:—

(1) The animal's own performance (in the case of the female).

(2) The pedigree or in other words the records of performance of the animal's ancestors.

and

(3) The animal's appearance or what is called its conformation.

Animal's own performance is gauged by recording its yield of milk daily or at regular intervals. When this is done for all the cows in the herd, it is called herd recording. As seasonal conditions are likely to change from one lactation of a cow to another, it will be wrong to judge her from a single lactation record. Cows of good dairy qualities which attain breedable age early in life before reaching the age of maturity, reach their maximum production during the 2nd or 3rd lactation. Hence the records of the first two lactations will tend to under rate a good cow. Consequently, if the average production record for a number of lactations is used as her record of performance, such average will give a better idea of her breeding value.

Regarding pedigree, it is sufficient to say that, when the heritability of the character looked for is low, the progress made is slow when consideration of pedigree is the only mode of selection. However, for untested animals like young bulls, just commencing service, pedigree combined with

conformation are the only best aids to selection.

In Britain and New Zealand it is now realised that the show quality like appearance or Dairy Conformation has very little relation to breeding value. A cow which has won prizes for her appearance in a show might also be a heavy milker which may be due to the fact that such cows are usually placed under favourable environmental conditions of feeding and management. Hence her lactation records may not have much value in judging her breeding worth.

No reliable estimates of the heritability of the character of draught ability are available. The reason is simple to understand because measuring draught quality is no easy task. In the case of milk, the daily yields can be weighed and if necessary the fat content of the milk can be tested with accuracy. But when it comes to measuring draught quality, one is at a loss to understand the "yard stick" to be applied. Qualities like sluggishness or quickness at the plough or the cart complicate the issue as these have no relation to pulling power as such. Many types of Dynamometers or similar mechnical contrivances mounted on wheels have been used for measuring draught qualities and complicated physiological formulae have been evolved for giving a measure of the draught indices of bullocks under observation. But, these devices have not proved satisfactory.

The ease with which some of the important breeders of Kangayam, Amritmahal and Hallikar cattle have bred good quality herds by resorting to aids to selection like ancestry and conformation, in the absence of results of progeny testing for draught characters, would indicate that the heritability of the character of draught ability is expected to be high. Otherwise, these breeders would not have met with the success they have had in the field. If the heritability of this character is high as assumed, it would probably look after itself should we select among these draught breeds on the basis of milk yield provided there is no strong negative genetic corelation between the two qualities. The existance of a strong negative genetic co-relation between the two characters would mean that there is a perfect tendency to vary in exactly opposite directions from one another. In other words, if we select for milk yield, the quality of draught-ability would suffer considerably and vice versa, if there is a strong negative genetic co-relation between the two. These aspects are of some importance while attempting to evolve amongst draught breeds of South India a dual purpose breed of animals which is expected to serve both the needs of the farmer—milk as well as work.

I have discussed at length the aids to selection for breeding quality animals. How far these principles can be applied under Indian conditions is another question. It may be said that the Indian breeder has definite disadvantages as compared to his counter-parts in the Western countries. The disadvantages which weigh heavily against Indian breeders of cattle can be listed as follows :—

(1) The land holdings are small. The carrying capacity of the land is very poor. Consequently the herd size is small.
(2) No specialised dairy farming as in U.S.A., Australia and New Zealand is being carried on. Usually milk production is incidental to producing food or cash crops.

(3) There are a number of well defined breeds both draught as well as milch and economic reasons have compelled the breeders in these areas to maintain the purity of the breeds irrespective of the rising demand for milk.

(4) The environmental conditions in Government Livestock Farms which are highly artificial due to heavy concentrate feeding cannot be compared to the poorer conditions existing in villages. Consequently results obtained in Government Farms are not applicable under village conditions.

(5) Though herds in Government farms are superior, these farms can issue only a limited number of bulls for breeding.

(6) Full advantage of artificial insemination is not taken because of some serious handicaps and also because of the still existing opposition to it in the country on grounds of sentiment.

Each of the above listed disadvantages would need some further explanation for making the position clear.

The land holdings, herd size and carrying capacity :

The average size of agricultural holdings especially in the Southern States of India is less than 5 acres. Most of it is cultivated for raising only food or cash crops. Grazing areas are therefore very much limited. The cattle as well as the human population have to live off the same land. Under such a set up the nutrition of the former is bound to suffer especially as the extent of the cultivable area per head of human population, is estimated to be 0.8 acre. The farmer tends to over-stock his small holding, with a large number of animals most of which are for work. So, from the dairying point of view, his herd size can be said to be very small. Under such conditions, culling cannot be done because he has no choice but to breed from all existing females and herd recording has therefore no meaning for him. The sale of one or two young bulls at a cattle fair brings him a better return than the sale of similar number of culled females. Hence breeding draught animals engages the attention of the majority of agriculturists in large tracts of India. They have not to worry about progeny tested bulls nor about heritability of the draught character, probably because as assumed above, the latter is really high. Under such conditions, the ideas of producing quality animals through better breeding can produce very little impression on the farmers.

Lack of specialised dairy farming

In our country keeping milch animals is mostly incidental to the producing of food or cash crops, except in towns and cities, where milch animals are reared but without any relation to land and its farming. The latter is made possible only due to concentrate feeding. Here also the herd size is small for lack of grazing and housing facilities. Therefore the dairy herds as such exist only in Government Livestock Farms and the few Milk Colonies. The owners of milch animals in urban areas and milk colonies have to content themselves with whatever breeding facilities that are provided for them by the Departments. These owners hardly care to enquire into the breeding worth of the bulls provided, but take them for granted.

The well defined breeds :

There are a large number of well defined

breeds in India which are bred in definite tracts called the breeding tracts. Even here, the average herd size is small. Only some families of nomadic breeders may have large sized herds. The breeders of these well defined breeds look only for the breed characteristics in the bulls. All females irrespective of whether they are good, average or below average are bred and no culling is practiced. These practices have been going on for generations. The type of agricultural economy in these various tracts as well as in the neighbouring areas has been and is still creating a demand for these breeds and the incentive for breeding them is thus kept up. The breeding practices have not undergone any changes. Progeny testing of bulls is not practicable under such circumstances.

Taking into consideration for instance, the Murrah breeding tract, we cannot say with certainty whether the breed has improved or whether it is in the same condition as before or has deteriorated. The only reliable records available for the breed are in Government Livestock Farms. The results obtained in these farms cannot be said to be representative of the conditions in the breeding tract, for obvious reasons. The best bulls produced in these farms are retained for the arduous task of keeping up the dairy qualities of the herds maintained in these farms. Only the second best are issued to the private breeders, and how far they are able to make an impression on the breed outside the farms, is something which is not easily assessable. The same is true of any other breeding tract.

Artificial Insemination

This is still a controversial subject with many private breeders and agriculturists, mainly on the grounds of sentiment. The small size of the herds, the very wide spread cattle population in vast rural tracts where communication is difficult, has added to the disadvantages involved in organising artificial insemination. But, in some Key Village Centres, cattle colonies and urban areas, artificial insemination has made some considerable headway because of the compactness of these areas and other facilities. Follow up work after insemination is very hard to do owing to the distances involved and the need to interview too large a number of owners of cows, most of whom do not possess more than a cow or two. The quality of the bulls issued to these centres, mostly from Government farms, has already been discussed. Under these circumstances, an accurate assessment of the improvement brought about by the artificial insemination programme becomes very difficult indeed.

In conclusion, I would like to state that under our conditions, our ability to adopt the modern principles of producing quality animals through better breeding is very much restricted except of course to some extent in Government Livestock Farms. When we consider the very huge population of non-descript animals distributed over vast tracts, the picture presents a very depressing aspect. The scope for utilising bulls of proved worth is very limited. Under these circumstances, cross-breeding on a large scale with bulls or Jersey or Holstein breeds in tracts where climatic conditions are favourable and where facilities for proper feeding, housing and marketing of milk are available, seems to be the only practical solution for achieving rapid improvement.

Any other way of attempting the breeding of quality animals may not even touch the fringe of the problem.

B. C. P. W.

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Keep Animals Free From Disease

by
G.L. Sharma

THE saying "The weaker the cattle, the scantier the production, the feebler the nation" is of vital significance to our country where agriculture plays a predominently important role in the national economy. We have to keep a constant vigil, putting in hard work according to a well planned programme to ensure that agricultural production which is comparatively at a low ebb is not only stepped up adequately to ensure sufficient and wholesome food for the people but also to take timely and suitable action to see that the rate of production of food may keep pace with the rise in human population. National strength depends on sound economy which in its turn is dependent in India to a considerable extent on the sound agriculture policy.

Livestock and its Importance in Agriculture :

Importance of livestock in agriculture needs no emphasis. In India livestock and particularly cattle play a vital role in the day to day life of the cultivator and the town dweller. The cattle provide traction force for the plough and irrigation, and for the transport of agricultural produce to the market ; they provide milk as a source of animal protein to the majority of the population which is vegetarians. Sheep, goats and poultry, besides producing meat and eggs for the nonvegetarians are also the source of wool and skins. Randhawa (Agriculture and Animal Husbandry in India, 1958) has given valuable information showing the impartant role that animals play in our national economy. Some of the figures are reproduced below :—

1. Animal Income from cattle = 1,135 crores. This is more than 50% the total agricultural income (2,200 crores).
2. Wool fetches from foreign markets an annual income of Rs. 100 million.
3. Income from skins and pelts of sheep = Rs. 178 million.
4. Income from skins of goats (about 22 million ever year) = Rs. 69 million.
5. Income from hairs of goats (7 million pounds) = Rs. 7.2 million.
6. Eggs from poultry (1,908. million every year) = Rs. 15.2 crores.

It would be no exaggeration to point out that the income from livestock, which due to

various causes operating over the centuries have got degenerated, can be substantially augmented if we improve the quality of the livestock and maintain this quality by ensuring protection against the ravages of diseases particularly infectious and parasitic diseases. What animal industry may mean in our national economy can be visualized by the living examples of Australia and Newzealand, and some of the other countries.

We excel in numbers in respect of different species of animals but unfortunately the production figures from the livestock, when compared with those of some of the progressive countries, are woefully small.

Large number of poor quality animals with low production :

In India there are 155 million cattle and 48 million buffaloes which comprise a little over one fourth of the world's total bovine population. In spite of this large number, milk consumption per capita is not even half of the minimum quantity required i.e. 10 to 15 ounces individual per day.

From the data given above it will be amply clear that the poor produce from cattle is responsible to a great extent for the poor economy and for the poor health of the people. It is rather strange that despite the veneration in which the cow has been held in this country from vedic age, the animal with the passage of time has got so much degenerated and has reached such a low stage of production. Holding the cow in veneration, which of course is due to the vital role it plays in our agriculture, is all the same a redeeming feature in so far as with this background the people could easily be made conscious of the importance of our achieving animal welfare which is to a large measure the back-bone of human welfare in the country.

It may be emphasized here that the large number of the uneconomical animals that we have should not be allowed to continue reproducing themselves unchecked ; such an animal is a definite sources of burden on the soil. Feed and cost of maintaining this poor quality animal would yield much better dividends from its counterpart of a better quality. Besides, many of these animals only help keeping the germs of infectious diseases alive in their bodies to pass them on to healthy animals. It is in view of these pressing circumstances that we have taken steps in restricting their reproduction by castration of the undesirable bulls and keeping them with the other animals in certain limited areas. Although adoption of such a measure entails prohibitive cost and calls for an extensive organizational machinary but perhaps unavoidable in view of the fact that other means of eliminating these poor quality animals are not practical in India.

Danger of Disease to Livestock Industry :

It is pleasing to note that the country is now realizing the importance of our possessing better types of animals and that several animal development programmes are underway in the field of animal genetics and animal nutrition, spending a large amount of money but it is here that we have to pause a while and take a serious note of the formidable danger of the ravages of animal diseases, which could undo in a short time, all that might be achieved over years of efforts in producing quality animals. The other aspects of the danger is that survivors from infectious and parasitic diseases, several of which are of course known to take a heavy toll of animal life, may be rendered permanently unproductive and sterile by irrepairable damage

to the vital organs like heart, liver, lungs, uterus, testicles, udder, the endocrine gland etc. Brucellosis, foot and mouth disease, tuberculosis, Johne's Disease, rinderpest, haemorrhagic septicaemia. sheep pox, goat pox, trichonomiasis, liver fluke infestation, parasitic pneumonia, ascarid infestation in calves, pyo-septicaemia in calves are a few of the many diseases which in the absence of suitable and timely preventive measures, could cut the very root of the animal development plans. What is the undermining effect of disease on animal development plans will be realised from the fact, that attempts to breed good type of horses by East India Company in 1774, were rendered futile by the incidence of diseases such as glanders, strangles, anthrax and *Bursati*. [Smithoors, J.F. (1958). Evolution of the Veterinary Art. Page 321. Bailliere, Tindall and Cox, London.]

The seriousness of disease problem due to the infectious diseases would be realised from the undermentioned data in respect of the morbidity and mortality rate of some of the diseases in the country ; the figures given represent the annual average of the last five years.

Table showing morbidity and mortality due to some of the Infectious Diseases ; figures represent the annual average in respect of the period 1957 to 1961.

Name of the Disease	Morbidity	Mortality
Rinderpest	44,907	18,075
Haemorrhagic septicaemia	45,547	35,469
Blackquarter	20,240	14,887
Anthrax	4,667	2,998
Foot-and-Mouth Disease	325,286	1,449

It may also be mentioned that apart from the infectious and parasitic diseases, there are nutritional diseases and other diseases which could adversely effect the development of animals.

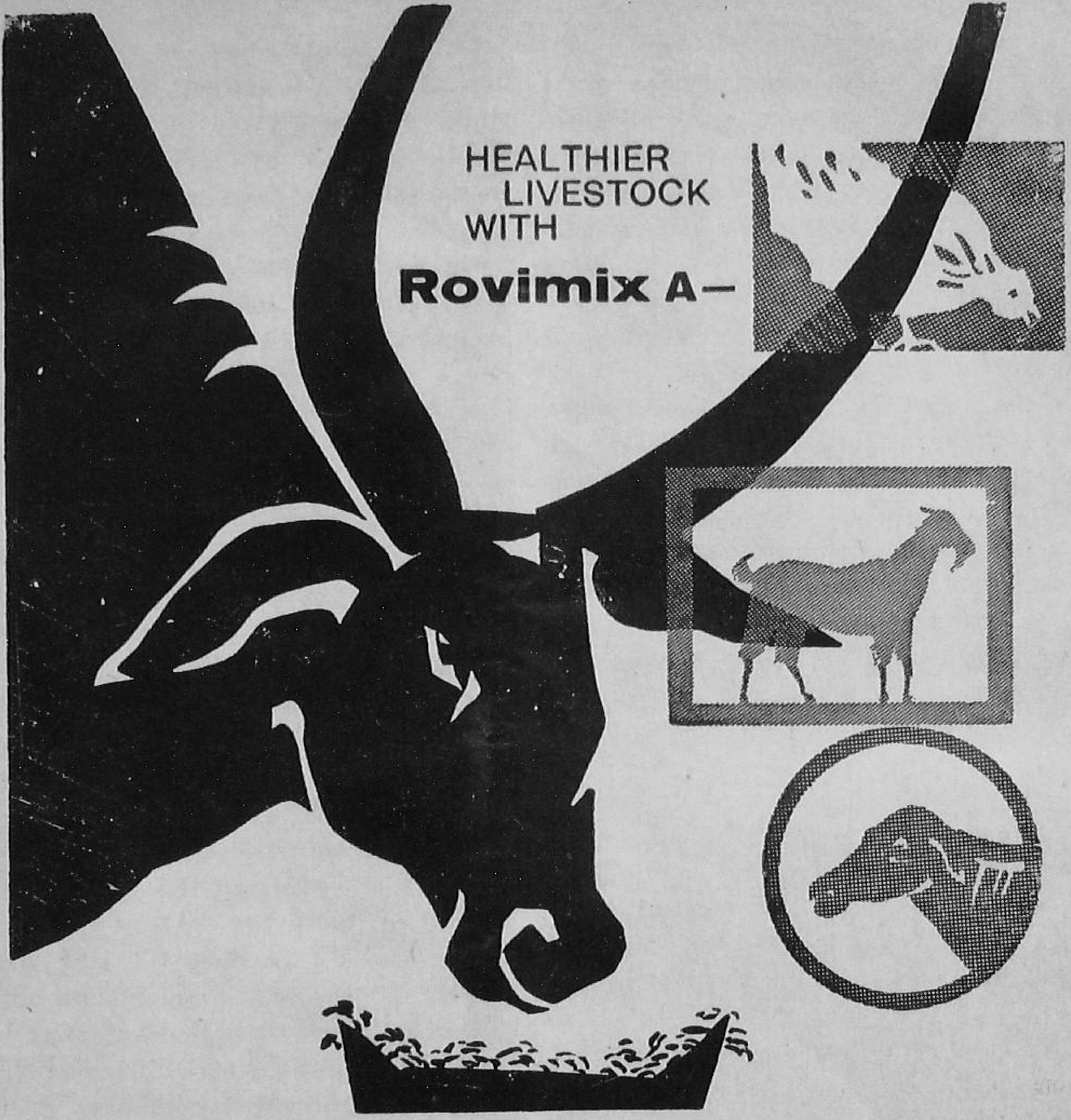
In view of what has been stated above it would be apparent that well planned and well organised machinery for disease control, with a view to keeping the animals free from disease, constitutes a vitally important aspect of the development of animal industry in the country.

Keeping Animals Free from Disease :

This brings us to the question as to how to keep animals free from disease. In this question are involved several aspects of the causes of disease as such, chemotherapy, Veterinary medicine and the problem of veterinary hygiene. Before dealing with the subject it will not be much of digression to make a mention of the fact that in India consciousness of the importance of disease control had led to the establishment of veterinary hospitals, at State expense (probably for the first time in the world) during the time of king Ashoka (250 B.C.). The next organized attempt for protection against animal disease was made by the Raman armies (A·D. 200) although the hospitals were temporary military estabishments only. (Smithcors, J.F. 1958. Evolution of the Veterinary Art. Page 18. Bailliere, Tindall and Cox, London). It may also be mentioned that ours is the only country, which because of our concept of animal care provides sanctuaries for old and decript animals (Datta, S. 1948, *Indian Vet. Jour, XXV : 115*).

Keeping animals free from disease on a cursory look might appear to be the treatment of individual animals brought to a Veterinary dispensary or casual vaccination of some

(*Contd. on Page 57*)



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(*Contd. from Page 55*)
animals against an infectious disease by the State veterinarian in the area under his jurisdiction. This is however, not so simple a proposition. The whole problem resolves itself into several different aspects such as (1) Training Institutions and Veterinary Colleges for (a) basic training in Veterinary Science and Animal Husbandry; (b) post-graduate training in various disciplines;

(2) Research on animal disease to evolve suitable control measures, including the development of suitable and afficacious biological agents such as vaccines and immune sera (anti-sera, sera) against infectious diseases,

(3) On the spot investigation into animal diseases to establish the diagnosis of the disease,

(4) Animal Health service to implement the prophylactic vaccinations in the field against animal diseases known to occur in different areas,

(5) Veterinary police to promptly report the occurrence of an infectious disease to the nearest veterinary authority and to check through its network the movements of affected animals with a view to preventing the spread of the disease,

(6) Organisation of a machinery to take such suitable steps as may deem necessary to prevent the introduction of an infectious disease into the country through import of livestock or livestock products by land, sea or air routes. Ensuring that all the animals and animal products being exported from the country are free from disease should also be one of the important duties of this organisation.

These are some of the necessities for ensuring that the animal development programmes through the implementation of animal breeding and animal feeding policies can successfully achieve the targets of quality and can maintain the quality without the fear of animal diseases decimating the progress. It is very important to point out here that coordination and cooperation between the various above mentioned activities is a 'must' as otherwise that whole objective may remain only a distant hope inspite of the human efforts made and expenses incurred within the framework of different water-tight compartments.

It is also essential to point out that the work of vererinary police, disease investigation and animal health staff can be of maximum utility only if there are adequate transport facilities to reach speedily the rural areas for rendering much needed timely assistance. It may now be worthwhile to briefly deal with the pattern of animal disease control work indicated above.

Training Institutions and Veterinary Colleges:

At the end of the First plan period there were 2650 veterinary hospitals, each hospital having to cater for about 77,000 heads of cattle (including buffaloes). [Mohan, S.N. (1962) Agriculture Production Manual I.C.A.R. Page 164]. Besides, there are other species of domestic animals that the Veterinary Surgeon, incharge of the hospital, has to deal with. This will show the stupendous task that a veterinarian incharge of a hospital is expected to shoulder. Whether it is possible to cater to the needs of such a large number of different species of animals by one veterinary hospital needs no dilation. There is a good case of opening new veterinary hospitals and for expending the facilities for training for having enough number of veterinarians. There is a great need for veterinary workers with specialized training in various disciplines, and towards this end, Post-Graduate College of

Animal Sciences, has recently been set up at the Indian Veterinary Research Institute and post-graduate training has also been taken up at some of the existing veterinary colleges.

Research on Animal Diseases :

It was in 1889 that Indian Veterinary Research Institute (then called Imperial Bacteriological laboratory) was set up to handle some of the diseases of animals. This organisation has since expanded its activities in research work in the field of animal diseases and is also actively engaged in research work in various other disciplines i.e. parasitology, poultry research, animal genetics, animal nutrition, and production of biologicals in mass scale with a view to providing adequate quantities of vaccines and sera for field use.

Our problems are however of such a magnitude and complexity in different parts of this vast country that there is increasing demand of our having research centres in different regions so that the problems of a particular area can be first studied extensively in the region itself so that detailed study if necessary, can be taken up subsequently at the central organisation. Running all the research organisations, will need well trained and experienced personnel and well equipped laboratories with readily available facilities for handling research problems. Much useful work has been done in the field of research on animal diseases. Today we have got efficacious vaccines against several of the important animal diseases such as Rinderpest, Ranikhet Disease, blackquarter, enterotoxaemia. More extensive work is however, need to be done for the effective solution of problems such as foot and mouth disease, brucellosis etc. and systematic study is also called for the recently detected diseases such as horse sickness, swine fever, mucosal disease etc.

Disease Investigation :

This has been put as separate item to give the emphasis that it deserves the units should however, preferably be a part of the Research organisations of veterinary colleges so that all facilities for bacteriological, virological, pathological work are available to efficiently handle the material collected from the outbreaks of diseases in the field. This is one unit which should be very strong to effectively deliver the goods to the veterinarians in the field. It should be mentioned here that this unit should have transport facilities and a 'mobile laboratory' so that diagnosis, wherever possible, is arrived at without the least delay and appropriate control measures adapted in time. Expenditure on these mobile 'laboratories' will bring better dividends and in addition to this there will be the much cherished reward of satisfaction to workers of the useful service rendered by them in protecting the valuable livestock.

Animals Health Service :

In the interest of the country as a whole it is essential that more emphasis is put on prevention rather than cure because timely preventive inoculation against some of the infectious diseases is far more desirable than adopting curative and sanitary control measures in the face of an outbreak of the disease. The system at present is that the veterinarian working in a hospital carries out the vaccinations when pressed for it, in the event of an outbreak of an infectious disease. This is the condition for no fault of his beacause the clinical work and other work that he is expected to do for the vast cattle population in the jurisdiction of the hospital is far too much for him and he has hardly any time for undertaking any work in respect of preventive veterinary medicine. Besides the work in respect of preventive inoculations, this organisation should systematically

study the epizootology of animal diseases and should have an overall assessment of the essential requirements for the animal health i.e. elimination of swamp areas, efficient disposal of animal excreta etc. This organisation may also be assigned the work of extension which forms an important link between the laboratory and the field. Visual aids, popular talks, to cultivators etc. would further bring home to the tillers of the soil, the vital importance of dealing with animal diseases systamatically in the light of the knowledge gained as a result of experimental work.

Veterinary Police :

Such a machinery is considered essential in dealing with an outbreak of a disease to ensure that the rules and regulations required for disease control are followed. The movement of the affected animals should be restricted to prevent the spread of the disease.

Our existing system of reporting the occurrence of animal diseases is rather poor with the result that by the time the information reaches the veterinarian or the Disease Investigation Officer, the disease has already had a good grip of the susceptible animals. Veterinary police among other things should immediately transmit the information about the occurence of the disease to the nearest Disease Investigation Officer so that it can be investigated without unnecessary loss of time thus ensuring the timely control of the disease.

Animal Import & Export Inspection :

Hazards of introduction of new animal disease have recently increased considerably as we are frequently importing some animals viz. bulls, cows, sheep, poultry, eggs, semen etc. for the implementation of some of our animal development schemes throughout the country (Sharma and Khera (1960), Hazards of introduction of some foreign diseases in India and measures to overcome them, paper presented at the 9th animal Diseases Conference held at Bhubaneswar, Orissa). In this context the care that we have to exercise to avoid the risk of introducing new animal diseases hardly needs any emphasis. Besides, some diseases may get entry into the country accidentally. For example, we were caught unaware when Horse Sickness struck our equine population in April 1960 in Rajasthan and therefrom it fanned out into the different States taking a very heavy toll of horse life. Similarly, blue tongue of sheep has been recorded in our neighbouring countries. Mucosal disease of cattle and swine fever which were formerly unheard of in this country are now with us and have posed a definite threat to our animal development programmes.

This organisation should also take all possible steps to ensure that animals and animal products such as hides, hairs, skins, etc. which are presented for export are free from infectious agents. Several of the foreign countries have put restrictions of importing animals and animal products primarily due to fear of the introduction of animal diseases into their countries.

A broad outline of the organisation for bringing about freedom of our livestock from disease has been indicated. In this context it will be realised that our problem is stupendous and to achieve the targets of animal development plans and self-sufficiency in food of animal origin, so badly needed for our people, it is considered essential that we initiate timely action to augment our animal disease control work. The efforts made and the amounts expended on this important issue are bound to build up our economy as it has done in several of the other agricultural countries.

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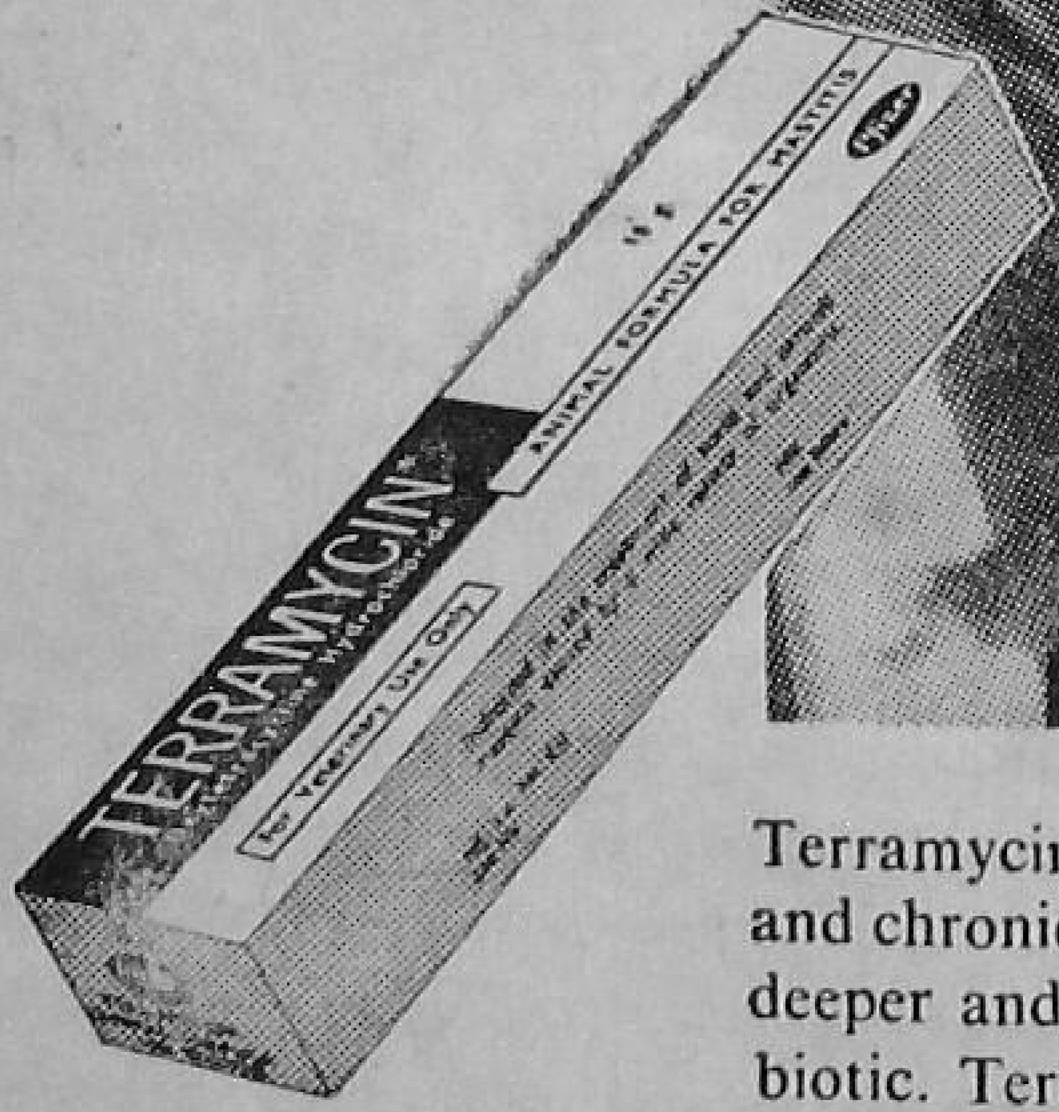

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By : **Shri Y. M. Parnerkar**

Quality of the Animal depends upon the quality of the

PERSONNEL

also!

OF the many factors that go to yield the maximum out of the cow, the role of personnel is one that needs immediate attention. It is a well recognised fact that all those who come in contact with the cow, directly or indirectly, help to stabilise her in our society culturally as well as economically and unless the efficiency of the personnel is raised the potentialities of the cow cannot be fully brought out.

Several types of personnel influence the cattle development programmes. Some of these physically come in contact with the cow while others help indirectly by planning, financing and implementing the various schemes and projects and therefore, every group will have to be dealt with separately.

The Goshala Labourer—for convenience sake we might call him the Gowala. He looks after the cow, feeds and grazes her, does the cleaning of the shelters and sheds and general sanitation is left to him. He milks the cow and nurses her when she is out of health, and in many places he is a general purpose handy man also. In small units the owner takes upon himself all these duties and in some cases the services of some assistants are secured. Almost all these Gowalas come from a class of illiterate people. All the skill which they have, is attained through family traditions or acquired during practical work. Every body connected with livestock production knows that the efficiency of this type of work largely tells upon the quality of the producer. Improper milking not only reduces milk yield but brings,

about a number of udder complications. A stone hurled at the cow or a miscalculated strict strock not only injures the cow but upsets her temperamentally. Selective grazing satisfies the cow, unsanitary handling comes in the way of maintaining the quality of milk. Has any body calculated the loss of equipment due to bad handling? Many a customers are lost because the deliveryman does not behave well with the members of the customer's family. Many such instances could be stated, but what do we do for the proper training of these men. It seems that it is normally felt that no special training is needed. Work itself will teach them. But it does not come true. How many of the students when they go back to their home carry the message of science with them. People in jobs and who are called "permanent persons" continue for reasonable period. Others change places or even professions. Thus there is a double waste and the profession of cow-keeping suffers in the long run. Short term practical training will enhance their skill and increase the efficiency of the institution.

The next group just above in the ladder consists of people like *overseers*, jamadars, work-supervisers and others. I do not think there is any regular training for them. Many of them are promoted to the first group and others are trained under the name of Stockmen, Village level workers etc. They are mostly supposed to work as *mukadams* to supervise the working of the Gowalas etc. A growing tendency is noticed that most of them like to avoid mannual work and pose as small *sahibs* and because there are so many *sahibs* above them they suffer from inferiority complex and avoid taking initiative. They believe only in carrying out orders.

Then we come to a class of college trained graduates in Agriculture and Animal Husbandry, Dairying etc. They do receive training in some branches of the science of cow-keeping. The field from which the trainees are recruited, the manner in which they are trained and the period of training etc. effect the quality of the workers turned out. There is a general tendency to neglect the practical side and the curriculum is overloaded with theoritical subjects. But there is no way out of it. The subject of cow keeping is a very vast and complicated one. The parents and the college staff members usually are in a hurry to finish up the course. In olden days it was argued that the institutional training is only an introduction to the subject and the proficiency has to be gained only by practice in the field. This was true when the man started as an assistant to some practical worker and gained experience under him. The posts were very limited and enough time had to be devoted before becoming an independent worker. This also guaranted the efficiency of the job, and we can see the high standard of the departments when headed by an officer who has risen from the rank. Today the things have changed. The number of jobs have substantially increased giving opportunities for rapid promotions. Foreign training is highly valued. Those who can afford it normally gain high positions and those who cannot, get frustrated and suffer from inferiority complex. Foreign education no doubt broadens the outlook but many times keep away from the realities of life, increases the tendencies of copying other countries and looking down upon the conditions in the country. The type of education imparted and the service conditions in the field result in lack of confidence and self reliance. How many of us who put in long years in teaching the newer knowledge of cow keeping to the masses take up to this profession after retirement? Even long

experience of as many as 25 to 30 years does not give the necessary confidence in what a person might have been preaching all along. Again, a growing tendency is marked for looking for some administrative job in preference to a technical one. A principal of a college or the Director of a research institution aspires for the post of the head of the department where his job consists mostly in digging the files, signing of the T.A. bills and passing transfer orders and carrying on departmental enquiries leaving almost no time for practical work. All this is not without any reason. It has a strong reason behind it. The society as well as the Government bestows more honour on the administrator than the technician. A competent clerk hopes to rise to a high post in the secretariat and can jump up from one department to another while the fate of animal husbandry graduate is sealed at the height of the Dy. Director or Director's post and that too at the fag end of his service period. The administrator has his own limitations. He has to wade through all the complicated rules and regulations and find out ways and means to satisfy the auditors; achieving of technical results is secondary. This has resulted in inferiority complex in our technician. Unlike his counterpart in human medicine the vaterinarian goes away from his profession as he rises up in the ladder. With the coming up of the stockmen and stock-supervisers he has put down his surgical knife and the castrators. The administering of medicines and the dressing of wound he had already left to his compounder. The day he becomes a Distt. Livestock Officer, files and inspection notes take up the place of case diagonosis. The same is more or less true of the other branches of cow keeping. All this has a great bearing on the success of many of our animal husbandry schemes and this noble profession is becoming day by day service centered. It would be a nice plan to start every worker from the bottom by giving practical experience. He may be asked to put in service in accordance with his other qualificationss and given full pay. Again when a worker selects a particular line he may be allowed promotion in that very place. To some extent the pay should go with the person and not with the post.

The consciousness of the consumer has also a very important place in the development of the cow. In the country, the consumer is normally not very particular whether milk has been produced under hygienic conditions or not, he is normally unconcerned with its quality and content. Rather he prefers toned and double toned milk to whole milk. If the consumer demands only quality milk, it would naturally have to be improved. Educating the consumer on right lines therefore, will go a long way towards the production and maintenance of quality animals as well as the products got from them.

The country is progressing in a planned way. A planning Commission has been constituted. But the question of the cow is a very complex one. It is tied up with the culture and traditions of the people. The cow is supposed to have acquired a place of high prestige in the society. She cannot be killed. The number of boarders is rapidly increasing making it difficult to feed her well within the limited resources. We have no effectIve methods of controlling the numbers. This problem has to be tackled in a planned way all over the country. If the cow has to be the basis of prosperity and has to serve the society as a *mother*, it is only the quality that will deliver the goods and the quality will depend upon the use the cow is put to and a strictness of watch is exercised on minimising the wastages.

Are we making full use of the cow and all that she produces ? How much food material is wasted by turning the milk into *ghee* and other products? The production of inferior quality bullocks has greatly come in the way of our agriculture production and has invited mechanical power where the bullock can do well. The bullock becomes unemployed but it cannot be slaughtered. It remains starved. After so many years of planning and research we have not been able to stop the buring of cow-dung which is so valuable especially in a tropical country like ours. With all the understanding about the economic value of the carcass and the employment this can give to the large number of our backward classes, not enough attention has been paid to the full utilization of the carcass.

Our planners have to find out a workable solution for all such questions, and a planned development has to take place. The cow has to be stabilised in our economics without disturbing the feelings of the people.

The role of our public workers cannot be over emphasised. Different people think of the cow in different ways. Every life is sacred and has to be saved. Others feel that because we have too many mouths to be fed and the food shortage for various reasons is increasing day by day, it is not possible to bring out substantial development. Some have made the cow a political issue. It is, therefore, the duty of all those who believe in the economic development of the cow and swear by her to educate the public mind on right scientific lines keeping in view our culture and traditions. This will greatly increase the efficiency of our cows and those who come in contact with her.

In a nutshell, it is an accepted fact that the skill, quality and thinking of all those who come in contact with the cow as well as those who influence her development play a great part in raising her position in our economic and cultural fields and therefore, all attempts should be made to promote our policies regarding the cow, plan scientifically our future programmes, educate the masses; bring together the planners, administrators, scientists, the philanthropists, public workers interested in the uplift of the cow; and impart scientific and up-to-date training right from the Gowala to the highest man in the line; all sort of casteism should cease. All our achievements will greatly depend upon the team work of all concerned workers. The various departments and sections will have to work in a coordinated manner. The amount of team work brought about and amongst the various types of workers will greatly determine the speed or progress.

The case of the cow has to be looked to in right perspective, her progress should be scientifically planned and these plans should be zealously implemented. All this is only possible when all who work for the uplift of the cow belong to high quality standard. The knowledge gained at the school or college cannot carry the officer through the life. The world is progressing rapidly especially in the field of science. New knowledge is pouring out every minute and if our officers are not to remain ignorant of the advance ; their knowledge has to be kept up to date, reading material should be provided to them, they should be allowed to visit progressive institutions and short term referesher cources be arranged for them. On the other hand there should be efficiency tests for promotions. Steps should be taken to see that the worker progreses in a particular line to a sufficiently long period and does not change his place because he gets a few rupees more at some other place.

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